DOCUMENT RESUME

ED 365 510 SE 053 774

AUTHOR	Vandegrift, Judith A.; Dickey, Linda
TITLE	Improving Mathematics and Science Education in Arizona: Recommendations for the Eisenhower Higher Education Program.
INSTITUTION	Arizona State Univ., Tempe. Morrison Inst. for Public Policy.
PUB DATE	Jun 93
NOTE	183p.
AVAILABLE FROM	Morrison Institute for Public Policy, School of Public Affairs, Arizona State University, Tempe, AZ 85287-4405.
PUB TYPE	Reports - Evaluative/Feasibility (142) -- Tests/Evaluation Instruments (160)
EDRS PRICE	MF01/PC08 Plus Postage.
DESCRIPTORS	Demonstration Programs; *Educational Assessment; Educational Improvement; Elementary Secondary Education; Federal Programs; Financial Support; Higher Education; Inservice Teacher Education; Instructional Improvement; *Mathematics Education; Preservice Teacher Education; *Program Improvement; School Surveys; *Science Education; *State Federal Aid; Teacher Attitudes
IDENTIFIERS	*Arizona; *Dwight D Eisenhower Math and Science Educ Program

ABSTRACT

In 1992, the dynamics of national and state math/science reform efforts prompted the Arizona Board of Regents to request a study to improve the development and dissemination of grants that are funded by the higher education portion of the Eisenhower Act. The results of that evaluation are presented in three parts. Part 1 reviews the reform efforts in mathematics and science education, the need to improve students' mathematics and science skills, and trends in mathematics and science K-12 education. Part 2 looks at the role of the state's institutions of higher education (IHE) Eisenhower programs, presents the methodology of the study, gives a history of Arizona's IHE Eisenhower Program, and discusses project questions and answers. Part 3 presents and discusses the nine recommendations related to full-time administrative staff; distribution and revision of requests for proposals; revision of the grant application review process; a coherent strategy for state-level IHE program evaluation; dissemination of effective mathematics and science education training programs; grant writing assistance and feedback; and coordination with the Arizona Department of Education. Ten appendices contain names of interviewees, interview and survey responses, perspectives from other states, analysis of Arizona Eisenhower RFPs, a list of Arizona IHE Eisenhower programs (1990-1993), federal regulations governing IHE Eisenhower Programs, and preliminary recommendations. (MDH)

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IMPROVING MATHEMATICS AND SCIENCE EDUCATION IN ARIZONA:

RECOMMENDATIONS FOR THE EISENHOWER HIGHER EDUCATION PROGRAM

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IMPROVING MATHEMATICS AND SCIENCE EDUCATION IN ARIZONA:

RECOMMENDATIONS FOR THE EISENHOWER HIGHER EDUCATION PROGRAM

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June 1993

EXECUTIVE SUMMARY

There are those who claim that improving mathematics and science skills in our nation's youth is the key to economic development. Others disagree, asserting that America is already producing more mathematicians and scientists than industry can employ. Yet *all* agree that developing a more technologically and numerically literate population is a worthy goal.

Toward meeting this goal, the charge to educators is weighty. Teachers are expected to implement new curricula, teach differently, develop new ways of assessing student competency, keep up-to-date with the changes in the fields of mathematics and science, become more sensitive to involving underrepresented populations in these areas, abandon old "math anxieties" ... the list goes on. In Arizona, teachers are also expected to keep pace with educational reform efforts including Arizona's revised mathematics and science curricula (the Arizona *Essential Skills*), and a new state-level student assessment program aligned with the *Essential Skills* curriculum frameworks.

One of the main federal sources of revenue to fund mathematics and science training and education comes from the Dwight D. Eisenhower Mathematics and Science Education Act. This Act provides Arizona with nearly three million dollars for student and teacher training programs in math and science. Over one-half million dollars of these funds are awarded annually to institutions of higher education (IHEs) through a competitive grant program administered by the Arizona Board of Regents. Remaining federal funds are allocated to Arizona's public schools through a program administered by the Arizona Department of Education.

In the spring of 1992, the dynamics of national and state math-science reform efforts prompted the Arizona Board of Regents to request a study "to improve the development and dissemination" of grants that are funded by the higher education portion of the Eisenhower Act. The Morrison Institute for Public Policy, School of Public Affairs, Arizona State University, was awarded a contract to conduct this study. From July 1992 through May 1993, this study of Arizona's higher education Eisenhower program involved the following activities:

- Interviewing 48 key stakeholders invested in improving "the state of mathematics and science education" in Arizona, including people throughout the state representing K-12 education; postsecondary departments of education, mathematics, and science; business and industry; state government agencies; and Arizona mathematics and science organizations.

- Monitoring the status of the Eisenhower Act with respect to its reauthorization by the 103rd Congress.

- Monitoring the status of the *Arizona State Systemic Initiative Proposal*, a proposal--ultimately *not* accepted--submitted to the National Science Foundation by the Arizona Department of Education to fund mathematics and science education reforms.

- Surveying K-12 teacher-training recipients with respect to 1) their overall assessment of their experience(s) as an IHE trainee and 2) their assessment of the specific training program in which they were involved in terms of six elements of "program quality."

- Attending the Texas IHE Eisenhower conference, and meeting with members of the external review panel who rated Arizona's most recent request for proposals (RFPs).

- Analyzing Arizona Board of Regents procedures in administering the IHE grant competition, including a review of its request for proposals.
- Summarizing key elements of 30 Arizona IHE projects funded since 1990.
- Surveying 21 western state agencies of higher education (SAHEs) regarding their administration and evaluation of IHE Eisenhower grants.
- Comparing federal regulations with state procedures governing deployment of IHE Eisenhower funds.
- Developing preliminary recommendations and presenting them to focus groups for reaction and commentary.

In sum, this study has sought to examine Arizona's higher education Eisenhower program with the goal to develop strategies to assist the Arizona Board of Regents more effectively deploy the state's limited resources. The results of this study suggest that Arizona's IHE program can benefit significantly from strengthening the program's leadership, redefining a process for distributing funds, designing a coherent state-level evaluation program, instituting support services for IHE Eisenhower grantees, and forging stronger interagency linkages to ensure program coordination with K-12 and other significant state-level reform efforts. To these ends, this report offers nine recommendations. Additional strategies encompassed within the scope of these recommendations are elaborated upon in the full report.

Recommendations

#1: Assign the day-to-day duties of administering the IHE Eisenhower program (for one-quarter time) to a permanent, full-time state employee with expertise in mathematics and science training and educational issues and programs.

#2: Work in coordination with the Arizona Department of Education to revise and institutionalize an annual funding cycle congruent with K-12 Eisenhower funding cycles.

#3: Broaden the distribution of IHE program information and RFPs.

#4: Revise the RFP, modeling it after other states' successful RFPs.

#5: Revise the grant application review process.

#6: Develop and implement a coherent strategy for state-level IHE program evaluation that is consistent with national and state goals for math and science.

#7: Disseminate "what works" in mathematics and science education and training.

#8: Provide grant-writing assistance and feedback.

#9: Work in coordination with the Arizona Department of Education to establish a permanent steering committee to jointly plan for the use of *all* state Eisenhower monies (i.e., K-12 and IHE), in concert with other reform efforts.

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INTRODUCTION

Why Review Arizona's Higher Education Eisenhower Program?

Major changes in the world of workplace technology have focused new attention on mathematics and science instruction. Educational reform efforts have been pushed by an expanding sense of urgency to improve student outcomes in mathematics and science, and thereby produce a more skilled workforce that will ensure future economic growth and development.

A number of groups have helped forge reforms in mathematics and science education at the national level. These include: American Association for the Advancement of Science (AAAS), National Science Foundation (NSF), National Council of Teachers of Mathematics (NCTM), National Science Board Commission on Precollege Education in Mathematics, Science and Technology, and others. Because of their efforts, new standards for curriculum and evaluation have already been established in mathematics, and are currently under development for science.

Sweeping reforms in Arizona have generally kept pace with those of the nation. Comprehensive curriculum modifications have been initiated in mathematics and science through Arizona *Essential Skills*, a set of documents following national precedents that prescribe content and thinking skills required for subject mastery at grades three, eight, and 12. Arizona is also in the process of refining the Arizona Student Assessment Program (ASAP) which encompasses a performance-based evaluation system aligned with the new curriculum guidelines. Furthermore, in October 1992, an Arizona proposal to NSF was submitted for a state systemic initiative (SSI) to improve teacher training and retraining in the areas of mathematics and science[1].

Within this shifting educational context, the Arizona Board of Regents (ABOR) administers the state's higher education allocation of federal funds from the Dwight D. Eisenhower Mathematics and Science Education Act. This Board oversees approximately $600,000 annually that is designated expressly for Arizona's institutions of higher education (IHEs) to offer mathematics and science training programs targeting K-12 students and teachers. Because of a desire for better accountability of Eisenhower-funded higher education projects and better alignment of these projects with state K-12 reform initiatives, ABOR sought proposals "to improve the *development* and *dissemination* of grants funded under the Mathematics and Science Higher Education Grants Program."

The Morrison Institute for Public Policy, School of Public Affairs, Arizona State University, subsequently was awarded a grant to produce a strategic plan for deployment of IHE Eisenhower funds. The report that follows documents Morrison Institute's work toward producing this plan. It is the cumulative result of a year-long investigation of math-science education and Eisenhower-funded training programs.

Part I of this report summarizes current thinking regarding mathematics and science education and provides context for the remainder of the report. Part II summarizes the results of Morrison Institute's research on math-science education and Eisenhower training in Arizona. Part III concludes with specific recommendations for improving Arizona's higher education Eisenhower programs.

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[1] This proposal was subsequently *not* accepted for funding by NSF.

PART I

Changing Times for Mathematics and Science Education

Mathematics and science education have long been the focus of reform efforts. Following the launch of Sputnik by the Soviets in 1957, Americans were convinced that they were losing the space race. In response, Congress passed the National Defense Education Act which provided millions of dollars to strengthen mathematics, science, and foreign language instruction. Continued support for mathematics and science education came through the Education for Economic Security Act, title II, part A of the Elementary and Secondary Education Act (ESEA) of 1965. This act was reauthorized by the Hawkins-Stafford Elementary and Secondary School Improvement Amendments of 1988 (P.L. 100-297) as the Dwight D. Eisenhower Mathematics and Science Act, and further amended following the Excellence in Mathematics, Science and Engineering Education Act of 1990 (P.L. 101-589).

The purpose of the Eisenhower program is as follows:

> "*...to strengthen the economic competitiveness and national security of the United States* by improving the skills of teachers and the quality of instruction in mathematics and science in the Nation's public and private elementary and secondary schools through assistance to State educational agencies, local educational agencies, and institutions of higher education" [*italics* added].

In recent years, the role of mathematics and science has undergone significant change. Declines in military spending and anticipated changes in the defense industry have meant that mathematics and science have become emphasized less as a means of strengthening national security and more as a means of improving economic competitiveness. Thus, a primary impetus for improving *workforce proficiency* in mathematics and science skills comes from the business-industry sector.

Mathematics, Science, and Economic Development

> "How can we improve student math and science scores? What is the best way to enrich an at-risk child's self-esteem? Would our school system be more effective if we adopted site-based management? ...These questions all point to a central theme--what can we do to improve education, and ultimately, workforce quality?" (Center for Workforce Preparation & Quality Education, 1992).

Across the country, the call for K-12 educational reform in *all* areas has been initiated or echoed by business and industry. In particular, criticism from the business community has been leveled at public education because employees fail to demonstrate "proficiency levels in reasoning and problem solving beyond the basic use of computation algorithms mastered in school" (Carnevale, Gainer, and Meltzer, 1990). Researchers, however, are quick to point out that the problem is *not* that workers are "quantitatively illiterate"; rather, it is that they fail to apply quantitative principles appropriately on the job (ibid.; see also Educational Testing Service, 1990).

Good education is considered vital for preparing the workforce of tomorrow for an "information-age" economy. Good education in mathematics and science education is considered especially crucial because these two areas are the bastions of computational literacy and problem solving skills--skills that American employers say their workers should possess to be successful in a competitive world economy. Such skills

will be essential for workers who want high paying jobs in one particular *kind* of industry: high technology.

According to *Education and Economic Growth: A Legislator's Guide* (Siegel, 1988), the new global economy is predicated on a significant industrial shift. Successful competitors will rely less on a machine base and more on a knowledge base and be increasingly bound to technology. Manufacturing, for example, will move away from the production of steel and textiles in favor of pharmaceuticals, electronic components, and health care instruments. The fastest growing occupations will come from high-technology fields (e.g., fiber optics; office automation). New applications of technology will affect many more existing jobs (e.g., an increasing use of computers in clerical jobs requiring new knowledge of word processing, spreadsheets, electronic communication, and other programs). Presumably, the kind of higher-order thinking skills developed through math and science instruction *will* be required.

The global economy will also see our domestic labor force compete directly with those from other nations. William B. Johnston, author of *Workforce 2000* (Hudson Institute, 1987), points out that the world workforce is growing rapidly (Johnston, 1991). He predicts that if current demographic and educational trends continue, an increasing share of the world's workforce will come from the developing world. These workers, Johnston says, will likely be just as well educated as American workers, or better, and they will work at lower wages. The implications are significant, says Johnston:

> "For more than a century, companies have moved manufacturing operations to take advantage of cheap labor. Now human capital, once considered to be the most stationary factor in production, increasingly flows across national borders as easily as cars, computer chips, and corporate bonds. Just as managers speak of world markets for products, technology, and capital, they must now think in terms of a world market for labor" (1991, p. 115).

America's ability to compete globally, says Marc Tucker, executive director of the Carnegie Forum on Education and the Economy (Siegel, 1988; cf. Carnevale and Johnston, 1989), rests on it becoming "a leading edge supplier of goods and services to the world [which] means being the first to invest and exploit new materials and new energy sources, to figure out how to produce goods that consume much less energy in their operation, to incorporate unprecedented levels of intelligence in the things we make, to identify and meet the needs of new markets, to invent more attractive products at much lower prices for established markets." This will require a well educated workforce capable of outperforming that of the developing world.

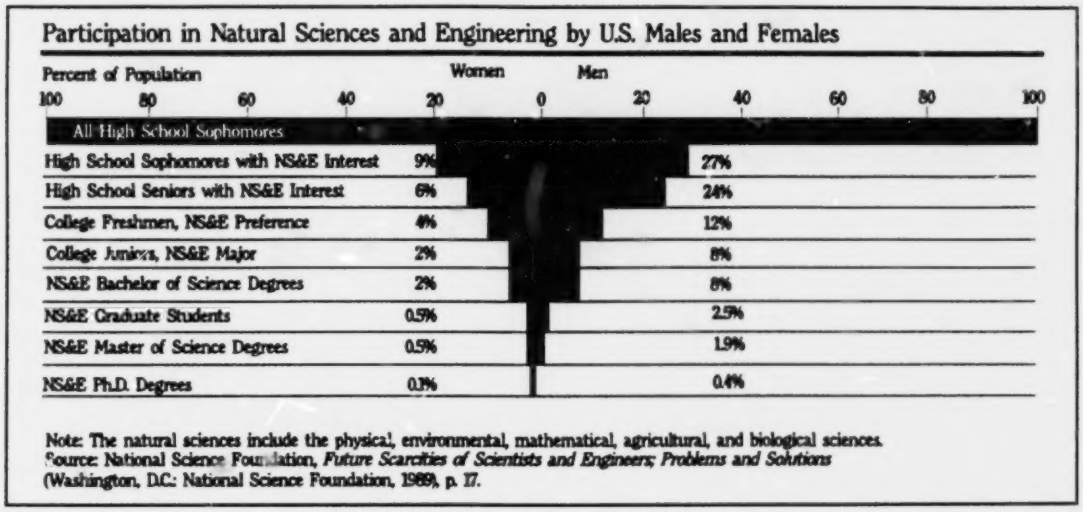
Those who express concern over America's ability to compete internationally cite, in part, American workers' lack of proficiency in mathematics and science. They tend to point out two trends: poor performance by American students on international standardized tests, and a scarcity of students at the highest levels of education (e.g., engineering, science). With respect to American students' test scores, Johnston notes:

> "International standardized tests suggest that high school students from many other nations are now better prepared, at least in mathematics and science. In tests given to high school students worldwide during the mid-1980s, for instance, U.S. seniors ranked thirteenth among 13 nations in biology, twelfth in chemistry, and tenth in physics. The U.S. performance looks even weaker considering that only a small fraction of American

students took the tests, while greater percentages of non-U.S. students did" (1991, p. 121).

This poor showing by American students is of particular concern because of the low percentage of students who complete majors in math and science. Figure 1 illustrates what has been called the higher education "pipeline."

Figure 1. The Higher Education "Pipeline"



Note: The natural sciences include the physical, environmental, mathematical, agricultural, and biological sciences.
Source: National Science Foundation, *Future Scarcities of Scientists and Engineers; Problems and Solutions* (Washington, D.C.: National Science Foundation, 1989), p. 17.

Apprehension is heightened by statistics showing that foreign-born students educated in the United States earn a large percentage of all doctorates awarded in this country: 51 percent of engineering doctorates, 48 percent of mathematics doctorates, 32 percent of business doctorates, and 29 percent of physical sciences doctorates (Johnston, 1991). Based on these statistics, some business analysts fear a future shortage of American experts in math and science.

Arizona's desire to produce a more technologically sophisticated workforce is as strong as that found elsewhere in the nation. According to the document, *Creating a 21st Century Economy: Arizona Strategic Plan for Economic Development*:

> "Improving math and science education is essential to raising the level of capability of all potential workers as well as enhancing the competence of Arizona's professional and technical workers. Excellent pre-college education prepares students for success at the postsecondary level and eventually helps relieve occupational shortages in the future (e.g., engineers). Strong K-12 math and science education also produces a more informed citizenry that can assess important public issues with technical content (e.g., hazardous waste disposal)" (Arizona Strategic Planning for Economic Development, 1991, p. V-14).

Work on the Arizona Strategic Plan for Economic Development (ASPED) began in 1990. This long-range plan for state economic growth and development eventually involved more than 4000 business representatives, educators, government employees and private citizens in creating strategies "to increase the standard of living and enhance opportunities for advancement by increasing per capita real wages, creating quality jobs, fostering enterprise, and improving the quality of life" (Arizona Strategic Plan for Economic Development, 1991).

ASPED launched a reconfiguration of Arizona business-industry into nine economic "clusters." These clusters are bolstered by, and contribute to, the development of quality human resources, accessible technology, capital availability, advanced physical and information infrastructure, a stable tax and regulatory environment, and a high quality of life for Arizonans. Leaders of the ASPED planning process view the improvement of math and science education as essential because it is a key component of the "technology foundation" for economic development.

The Need to Improve Mathematics and Science Skills: Myth or Reality?

There *are* some who argue that America does not need to produce more mathematicians, scientists, and engineers. One of these is Arizona State University Professor David Berliner who presents a case *against* "being the number one nation in science and mathematics" (1992, p. 35). Citing research supported by the Sandia National Laboratories (Carson, Heulskamp, and Woodall, 1991), Educational Testing Service (1991), Economic Policy Institute (Mishel and Teixeira, 1991), and labor economist John Bishop (1990), Berliner not only claims that America produces more mathematicians and scientists than are demanded, but also cites evidence that few, if any, financial rewards exist in the business and industrial worlds for excelling in these areas. Berliner further states that "if we have lost our economic edge in the world market place it may well be because of poor business management and faulty government economic policies, but it is certainly not due to the lack of a technically skilled workforce" (ibid., p. 32).

Even when considering projected job openings that are dependent upon the growth of high technology industry, Berliner argues against producing more mathematicians and scientists. He states:

> "The Sandia report estimates that even with no increase in the rate of supply of scientists and engineers we will accumulate a surplus of about one million by the year 2010. Given the reduction in military spending we are likely to see over the next few years, the glut of trained scientists is likely to be even higher than the forecasts that were made a year or two ago" (ibid.).

Berliner also asserts that even if we were to face future shortages of American-born technical experts, we could still draw upon trained foreigners, but "that is, of course, if we can get over our xenophobia and racism" (Berliner, 1992, p. 35). This argument is supported somewhat by Johnston (1991), who notes that many foreign-born students educated in the United States are likely to remain in this country and become productive members of the U.S. workforce. And, Johnston notes, even if they do not remain in the United States, "they stimulate the economy--by enhancing trade relationships" (1991, p. 124).

Berliner is not alone in his beliefs. Siegel (1988), for example, predicts that the rise of technological applications in the workplace will simplify and standardize work tasks, resulting in the displacement of skilled workers and the undermining of employment. Siegel cites the work of Stanford University researchers, Levin and Rumberger, who write: "Not only will high tech provide few job opportunities

in the future economy, but most jobs will require no post-secondary schooling and will pay wages significantly lower than the average" (1984).

Regardless of whether or not more highly-trained workers are needed for economic development, one objective of mathematics and science education reform is beyond dispute. All analysts agree that we need to increase America's "technological literacy." This need provided motivation for the development of a national goal addressing mathematics and science education. That goal is discussed in the following section of this report.

Trends in Mathematics and Science K-12 Education

At the 1989 Governors' Education Summit at which President George Bush presided, six goals were adopted as part of a national education strategy dubbed *AMERICA 2000*. The six goals focus on: 1) school readiness, 2) high school completion, 3) student achievement, 4) science and mathematics, 5) adult literacy and lifelong learning, and 6) safe, disciplined, and drug-free schools. It should be noted that Goal Four is unique among the other national goals in that it specifically names science and mathematics while the other goals generally address more encompassing sets of issues. Why single out science and mathematics?

> "...because our future depends so directly on a steady flow of strong and imaginative research leaders, as well as a quantitatively and scientifically literate workforce. ...The quality of American life is endangered when people cannot make informed social and political decisions on issues that are increasingly shaped by science, mathematics, and technology. The Nation needs, in addition to a steady supply of scientists, mathematicians, and engineers, a scientifically literate and numerate population" (The National Education Goals Panel, *Measuring Progress Toward the National Education Goals: Potential Indicators and Measurement Strategies*, 1991).

The National Education Goals Panel asserts that to achieve the objective of "first in the world" in science and mathematics by the year 2000, we "must develop an infrastructure that creates and nurtures a world-class education system." This infrastructure should provide public support, teacher professionalism, educational equity for all children, national curriculum standards, "cutting edge" instructional materials and equipment, and assessment and accountability systems that measure the valued knowledge, skills, and processes promulgated by national curriculum standards.

A report by the National Governors' Association Task Force on Education, *Educating America: State Strategies for Achieving the National Educational Goals* (National Governors' Association, 1990), likewise emphasizes teacher training and retraining, curriculum development and assessment procedures, and educational equity issues. Taken together, the work of these two major organizations--the National Education Goals Panel and the National Governors' Association Task Force on Education--essentially identifies four reforms needed in mathematics and science education. They are:

- improvement of public awareness and appreciation of the importance of math and science
- development of new curricula and meaningful measurement systems
- assurance of equitable access to courses and equipment
- improvement of teacher preparation and retraining

Eisenhower Higher Education Programs

Calls for educational reforms have not gone unnoticed. Across the nation, states have rallied to implement new mathematics and science strategies aligned with *AMERICA 2000*. Where does Arizona stand in these efforts?

► **Improvement of public awareness and appreciation of the importance of math and science**

The 22nd Annual Gallup Poll of the Public's Attitudes Toward the Public School highlighted the need for improving public awareness of the importance of math and science achievement. This poll showed that among *AMERICA 2000*'s six national goals, Goal Four was given the lowest priority and the second lowest likelihood of attainment (cf. National Educational Goals Panel, 1991).

In an effort to improve math and science awareness in Arizona, the state has developed a unique partnership between Arizona media broadcasters and the Arizona Department of Education (ADE). This partnership--the only one of its kind in the country--focuses on stimulating public support for math-science reform efforts. Moreover, the National Association of Broadcasters "is considering using Arizona as a model for partnerships to improve mathematics and science in other states" (Arizona Department of Education, 1992).

Recognizing that more work is needed in this area, Arizona designated "galvanizing public support and involvement" as one of three targeted areas of reform in its recent *Arizona State Systemic Initiative Proposal* (submitted by ADE to the National Science Foundation in October 1992). This proposal suggested expanding the public outreach effort begun by ADE and Arizona broadcasters by outlining such initiatives as the development of an aggressive public relations campaign and the organization of a speaker's bureau.

► **Development of new curricula and meaningful measurement systems**

Many observers have noted that mathematics and science instruction are too often textbook driven and unrelated to real-world applications. Furthermore, assessment instruments focus primarily on basic skills rather than more advanced skills, and fail to provide meaningful measurement of valued abilities (National Governors' Association, 1990).

Arizona has made important progress in addressing such concerns. Since the 1987 passage of the reform bill titled "Arizona's Goals for Educational Excellence," comprehensive curriculum reforms have been initiated in mathematics and science through the adoption of Arizona *Essential Skills*. The *Essential Skills* documents provide curriculum frameworks that prescribe content and thinking skills required for subject mastery at grades three, eight, and 12. Mathematics *Essential Skills* are aligned with standards set by the National Council of Teachers of Mathematics (*Curriculum and Evaluation Standards*, National Council of Teachers of Mathematics, 1989), while Science *Essential Skills* are modeled after curriculum reforms proposed in Project 2061 by the American Association for the Advancement of Science. Arizona is also in the process of developing and refining its Arizona Student Assessment Program (ASAP), which includes performance-based assessments aligned with new curriculum guidelines.

Arizona is one of 22 states in which the mathematics curriculum framework has a "direct" relationship to the state mathematics assessment, and one of 16 states with a science curriculum aligned with the state science assessment (Council of Chief State School Officers, *State Policies on Science and Mathematics*

Education, 1992). In the areas of curriculum reform and student assessment, therefore, Arizona is definitely "ahead of the curve."

► **Assurance of equitable access to courses and equipment**

Concerns regarding equal access to courses and equipment exist at all levels of education from kindergarten through postsecondary. Nationally, numerous disparities among schools have been documented in terms of access to laboratory equipment, availability of advanced courses (and even basic courses), and numbers of certified teachers capable of teaching advanced courses (cf. National Governors' Association, 1990; Quality Education for Minorities Project, 1990).

Arizona's approach to equal access parallels that of other states. Many specific projects offered through a variety of funding streams address the needs of Arizona students who are handicapped, economically disadvantaged, from rural areas, female, or members of other underrepresented minorities. Exemplary programs include a nationally recognized statewide partnership program called Project PRIME (Project to Improve Minority Education), the NSF-funded Maricopa County Comprehensive Regional Center for Minorities, and the NSF-funded Project SMART (Science and Math for Arizona Rural Teachers). These programs successfully reach students and teachers who are among those historically underrepresented in mathematics and science.

Attempts to effect even greater *systemic* change in educational equity are reflected in the efforts of the Arizona Minority Education Access and Achievement Cooperative (AMEAAC). Formed in 1989, AMEAAC is a voluntary association of senior-level public education officials and citizens dedicated to improving minority educational achievement through cooperative planning, program development, and shared expertise (AMEAAC, 1991). AMEAAC has funded, supported, and publicized many programs that address minority participation and representation in mathematics and science. These efforts have been most recently illustrated by the development and dissemination of a comprehensive inventory of programs serving minority populations, many of which have a mathematics and science focus (AMEAAC, 1992).

► **Improvement of teacher preparation and retraining**

According to the report, *State Policies on Science and Mathematics Education* (CCSSO, 1992), Arizona ranks *average* among states with respect to standards for elementary teacher preparation and secondary level certification in mathematics and science. In particular, the CCSSO report notes two important teacher training reforms that have received "policy action" from many states since 1987: 1) establishment of separate middle school certification, and 2) requirement of secondary teachers to major in mathematics or one of the science fields instead of mathematics or science *education*. Regarding the first reform, more than half the states (30) have implemented separate certification requirements for middle grade teacher certification. Arizona has not. Regarding the second reform, 22 states have established policies requiring secondary teachers to major in mathematics or one of the sciences. Arizona has not.

As elsewhere, underrepresentation of ethnic minority teachers is prevalent in Arizona. In grades K-12, roughly one out of every ten teachers (13 percent) is non-white, while almost four out of every ten students (38 percent) are non-white (Arizona Department of Education *Statistical and Financial Data for Fiscal Year 1990-91*; Council of Chief State School Officers *State Education Indicators 1990*). This is cause for concern.

Eisenhower Higher Education Programs

The state's recent *Arizona State Systemic Initiative Proposal* (Arizona Department of Education, 1992) to NSF addressed some teacher training concerns. It called for revision of teacher preservice programs and considerable expansion and revision of teacher training opportunities. Recommendations included the retraining of practicing teachers through summer academies and teacher training centers, and the alignment of preservice programs with the state's revised curriculum frameworks and ASAP. Educational equity issues were also incorporated within the proposed reforms for teacher training and retraining.

PART II

Arizona's Mathematics and Science IHE Eisenhower Program

A recent article laments the apparent fact that "Americans of all ages and in all walks of life tend to be scientifically and technologically illiterate" (Fort, 1993). The author notes, however, that a variety of national and state reform efforts are underway for developing a "science savvy" country. While Part I discussed some of Arizona's broader reform efforts in mathematics and science education, Part II will look more closely at the role of the state's higher education Eisenhower programs within the larger context of developing a science savvy community of learners.

Methodology of the Project

This study of Arizona's higher education Eisenhower program was proposed in two phases: Phase I (July 1992 - December 1992) would lay the groundwork for development of a strategic plan for IHE Eisenhower funds, while Phase II (January 1993 - June 1993) would undertake a "grassroots" planning effort.

During Phase I of the research, Morrison Institute analysts conducted extensive reviews of the literature, attended state-level meetings on mathematics and science education reform efforts, and interviewed 48 key "stakeholders" invested in improving "the state of mathematics and science education" in Arizona. These stakeholders included people throughout the state representing K-12 education; postsecondary departments of education, mathematics, and science; business and industry; state government agencies; and Arizona mathematics and science organizations (see Appendix A).

In selecting interviewees, the intent was to elicit opinions from a diverse group of math and science faculty, teacher trainers and the recipients of training, as well as business and industry representatives and members of state agencies. Target groups included members of the steering committee for Arizona's State Systemic Initiative (SSI), and past and present IHE Eisenhower grant recipients and their training recipients. In particular, feedback was drawn from IHE Eisenhower grant recipients about elements of their programs that have either been successful or problematic. They were also asked to comment on the Arizona Eisenhower proposal process and evaluation requirements.

A sample of members of the SSI Steering Committee was selected that represented organization leaders, postsecondary representatives (university and community college personnel), and business and industry representatives. The intent was to have representation from active and informed participants in math-science reform efforts, rather than merely a "statistically representative" sample of respondents from each category. In addition, deans of the colleges of education from Arizona State University, University of Arizona, and Northern Arizona University were contacted, as was the "unit director" for education at ASU-West and a representative from Grand Canyon University. All interviews were strictly voluntary; where primary contacts declined interviews, they referred researchers to other people in their agency or organization.

Apart from soliciting interviews, Morrison Institute staff also attended meetings with the state's SSI steering committee, the K-12 Eisenhower-funded rural consortia members, and members of the business and industry community. These interviews and meetings provided much specific information pertaining to IHE Eisenhower grants and the use of higher education funds. Information also was obtained regarding

the state of mathematics and science education in Arizona, and telephone interviews were held with federal Eisenhower program personnel and other national agency representatives.

Most of the interviews were audio-taped and transcribed. Several respondents provided written answers to the interview questions. For the remaining interviews, notes were taken. Meeting and interview notes, transcripts, and written responses were analyzed qualitatively for the purposes of this report.

Phase I research brought to light two factors which could have profound implications for the future use of higher education Eisenhower funds in Arizona. First, the Arizona Department of Education submitted a major proposal to the National Science Foundation outlining a state systemic initiative for reforming mathematics and science education in grades K-12. Second, the Eisenhower Act was scheduled for congressional reauthorization early in 1993. After examining four possible courses of action that Arizona could take in view of potential interaction between the SSI proposal and reauthorization, an interim recommendation was made to the Arizona Board of Regents to delay the development of a strategic plan until the outcome of each event became known. (Appendix B provides a brief overview of the *Arizona State Systemic Initiative Proposal* and an overview of proposed legislative changes affecting the current status of the Eisenhower Act. A brief summary of the implications of these two events is also provided.)

From January through March of 1993, Morrison Institute analysts pursued several avenues for developing a strategic plan. Among these:

- An analysis of interviews with key respondents was completed with respect to questions central to math-science education and training in Arizona (see Appendix C).

- Additional comments regarding higher education projects were sought from K-12 training recipients (see Appendix D). Current IHE project personnel assisted in identifying local educational agency (LEA) contacts who were subsequently surveyed regarding: a) their overall assessment of experiences as an IHE trainee, and b) their assessment of the specific training program in which they were involved in terms of the six elements of program quality.

- A Morrison Institute analyst attended the Texas IHE Eisenhower conference and had the opportunity to speak with members of the external review panel who rated Arizona's most recent requests for proposals (RFPs). Their comments and critiques were analyzed both with respect to proposal submissions and the administration of the IHE Eisenhower program (see Appendix E).

- A survey of western state agencies of higher education (SAHEs) was conducted regarding the administration and evaluation of IHE Eisenhower grants (see Appendix F).

- Arizona's RFPs were analyzed "side-by-side" for the past three funding cycles (see Appendix G).

- Thirty of Arizona's IHE Eisenhower-funded program proposals were analyzed regarding various program elements (see Appendix H).

- The status of both the SSI grant application and Eisenhower reauthorization were monitored.

As of *early* May, no final determination had been made on the state's SSI proposal or reauthorization. Despite these uncertainties, Phase II proceeded with the development of a plan because of the quality of the input received from the field and the amount of information researchers had obtained. Recommendations were developed which incorporated the initial input of key stakeholders as well as K-12 practitioners and out-of-state reviewers. Some recommendations were predicated on the experiences of other states.

In *late* May, preliminary recommendations were presented at a meeting with key respondents for their reactions and revisions. One day prior to this event, Morrison Institute analysts were notified that the *Arizona State Systemic Initiative Proposal* was *not* funded by NSF. Alternative recommendations for state systemic reform were discussed by the panel of experts assembled in light of this development. The meeting proceeded with the final status of reauthorization unknown (cf. Appendix B).

Recommendations in Part III of this report are largely the result of this external review process.

An Overview of the Dwight D. Eisenhower Mathematics and Science Act

Prior to discussing Arizona's IHE Eisenhower program, a brief overview of the Dwight D. Eisenhower Act itself is in order[2]. States are required to submit a state application for Eisenhower funds to the United State Department of Education every three years. Once approved, each state receives a federal allocation of Eisenhower funds distributed on an annual basis.

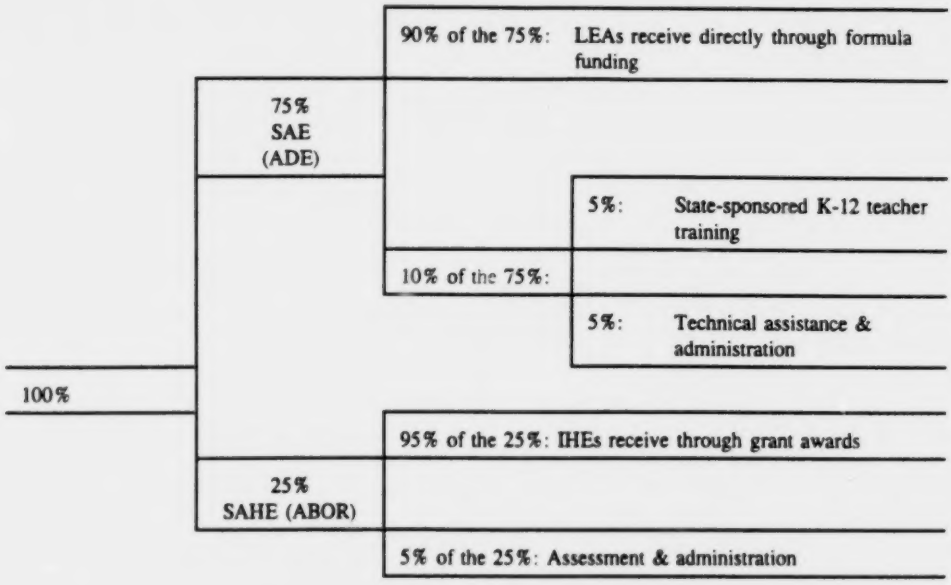
Of the total state allocation, 75 percent is administered by the state agency for education (SAE) which, in Arizona, is the Arizona Department of Education (ADE). ADE distributes 90 percent of their allotted funds directly to local educational agencies (LEAs) through formula funding based on the LEA's total number of students enrolled and the number eligible for Chapter 1. Each LEA must apply to the state for these funds, showing evidence of a completed needs assessment and documentation of how the monies will be used to improve teacher training in mathematics and science. The remaining ten percent of the ADE's funding is used by the department for program administration and state-sponsored training programs.

The state agency for *higher* education (SAHE), which in Arizona is the Arizona Board of Regents, receives the other 25 percent of the total state allocation. Most of these funds are distributed to institutions of higher education (IHEs) through a competitive grant process. A small portion of ABOR's allocation (i.e., five percent) is used for the administration of the grant program (see Figure 2).

Since inception, IHE Eisenhower programs have maintained certain emphases. For example, two general categories of programs have been supported by the Eisenhower Act: 1) cooperative programs, and 2) teacher preparation and enhancement programs.

[2] Appendix I includes relevant excerpts from federal requirements pertaining to the administration of IHE Eisenhower programs.

Figure 2. State Allocation of Eisenhower Funds


100%
75% SAE (ADE)
90% of the 75%: LEAs receive directly through formula funding
5%: State-sponsored K-12 teacher training
10% of the 75%:
5%: Technical assistance & administration
25% SAHE (ABOR)
95% of the 25%: IHEs receive through grant awards
5% of the 25%: Assessment & administration

Cooperative programs are those which involve "institutions of higher education, local educational agencies, state educational agencies, private industry, and nonprofit organizations, including museums, libraries, educational television stations, and professional mathematics, science, and engineering societies and associations" in the development and dissemination of "projects designed to improve student understanding and performance in science and mathematics" (Elementary and Secondary Education Act, title II, Part A, Sec. 2007, 3 (c); 34 CFR Part 208, Subpart D, 208.31, (a),(3) and 208.32). These projects allow IHEs and cooperative partners to implement programs that provide direct student services.

Teacher preparation and enhancement programs may fall into one of three categories:

- *traineeship programs* for new teachers who will specialize in teaching mathematics and science
- *retraining* either for a) teachers of other disciplines who wish to specialize in the teaching of mathematics or science, or for 2) secondary teachers of mathematics and science who wish to expand their areas of specialization
- *in-service training* for elementary, middle, secondary, and vocational school teachers, and for other appropriate school personnel, to improve their mathematics and science teaching skills (34 CFR Part 208, Subpart D, 208.33, (a), (1), (2i) (2ii), (3); and 208.32).

Another emphasis of IHE Eisenhower programs has been a requirement for IHEs to link with a local educational agency and to focus on recruiting trainees who represent and/or serve historically underrepresented and underserved groups *including* females, minorities, individuals with limited English proficiency, the handicapped, and migrants. Each state must also consider "the needs of teachers and students in areas of high concentrations of low-income students and sparsely populated areas" in its

distribution of funds (34 CFR Part 208, Subpart B, 208.11(b)(2)(vii)). IHEs are further encouraged, but not required, to develop partnerships with business and industry.

In 1990, the President signed into law the new Mathematics, Science and Engineering Education Act which made several changes to the Eisenhower Act. Two of these changes are of particular importance. First, there is a shift of training, retraining, and in-service programs *away* from secondary level teachers and *to* elementary and middle school teachers. Second, there is a new emphasis on the quality of training programs.

Regarding the second change, an IHE applicant is now required to "provide evidence that the training activities it proposes to implement are of high quality and sufficient duration to promote a lasting and positive effect on teacher performance" (Federal Register, Vol. 57. No. 99, Thursday, May 21, 1992, p. 21711). Six criteria upon which to judge "high quality" have been identified by SRI International and endorsed by the U.S. Department of Education. SRI findings reveal that "professional development activities are most effective if they (1) are related to long-term improvement goals, (2) are of sufficient intensity to allow for integration into understanding and implementation, (3) are related to classroom assignments, (4) include professional teams (rather than individuals) that can work with each other over time, (5) have follow-up activities or reinforcement activities or both, and (6) have the administrative and policy support of the school or LEA" (ibid). The U.S. Department of Education recommends that states, LEAs, and IHEs develop their professional training strategies using these criteria as guidelines.

A Brief History of Arizona's IHE Eisenhower Program

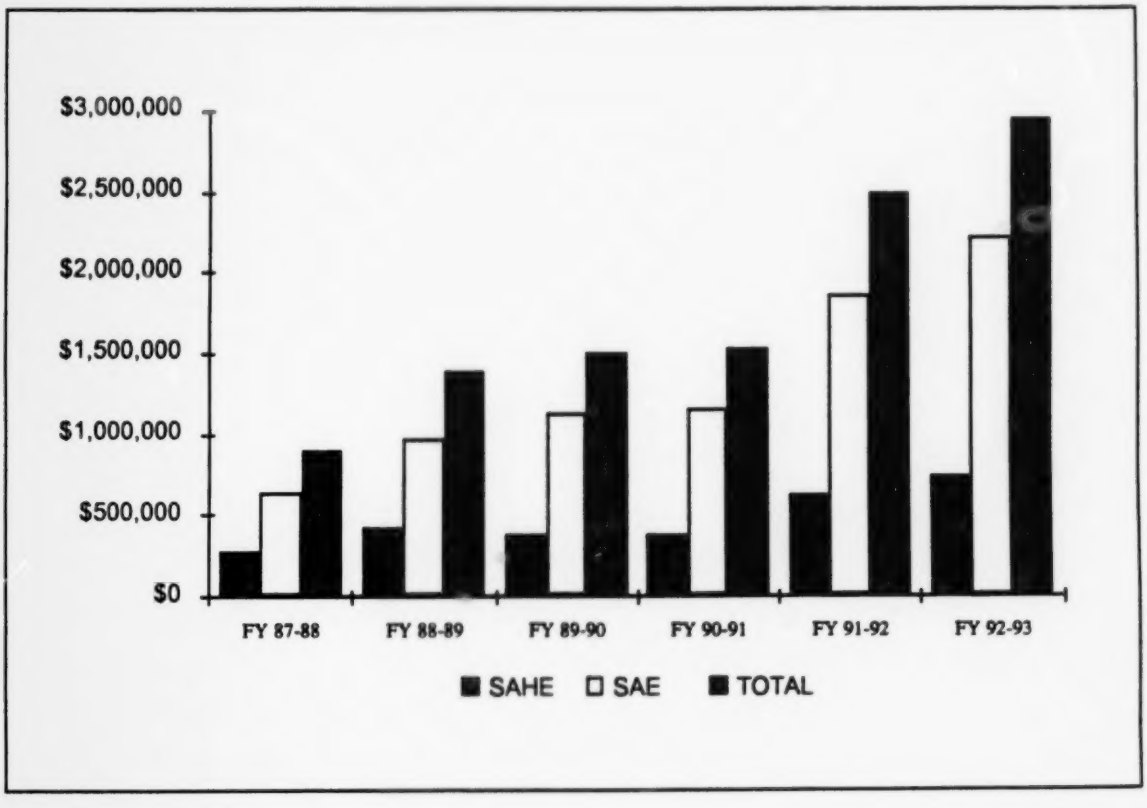
Over the years, Arizona has benefitted from increasingly greater allocations of federal Eisenhower monies (see Table 1; Figure 3) due to a growing K-12 student population. As noted, ABOR oversees the distribution of the state's federal allocation of Eisenhower monies for institutions of higher education (IHEs). But since at least FY 1989-90, the grant competition has been administered by a different person each year. This situation occurred because, in both FY 1990-91 and FY 1991-92, responsibility for the grant competition was removed from the Board's associate director for academic programs, who previously oversaw the competition, and assigned to a "loaned executive." These loaned executives were university employees who served one-year internships at the Board. During the two years that the loaned executives were assigned, their duties included developing and distributing the Eisenhower RFPs, overseeing the grant competitions, and supervising the maintenance and administration of the IHE Eisenhower program. For the past academic year (FY 1992-93), however, the program was again under the purview of the interim associate director for academic programs.

Table 1: Arizona Eisenhower Monies (1987-1993)

Fiscal Year	SAHE Allocation (ABOR)	SAE Allocation (ADE)	TOTAL
1987-88	$270,160	$630,372	$900,532
1988-89	$415,540	$969,594	$1,385,134
1989-90	$374,741	$1,124,224	$1,498,965
1990-91	$383,712	$1,151,135	$1,534,847
1991-92	$622,360	$1,867,080	$2,489,440
1992-93	$739,088	$2,217,254	$2,956,352

NOTE: Table 1 dollar amounts are based on the 75 percent SAE/25 percent SAHE distribution of funds for fiscal years 1989-90 through 1992-93. Prior to 1989-90, the distribution was 70 percent SAE/30 percent SAHE. This change in the percentages accounts for the decrease of SAHE monies between FY 1988-89 and 1989-90.

Figure 3. Arizona Eisenhower Monies (1987-1993)



Despite seeing that certain advantages accrued from having a loaned executive as program administrator, the Board recognized a lack of continuity as a result. Therefore, discussions were held during the 1992-93 fiscal year to consider whether or not to hire a permanent employee to administer the IHE program. Current plans for FY 1993-94 are to hire a quarter-time "Eisenhower Program Coordinator."

Also since FY 1989-90, a variety of changes occurred on a year-by-year basis in Arizona's RFP requirements. Morrison Institute analysts examined the last three RFPs and noted many significant changes which are capsulized in Table 2 and documented in greater detail in Appendix G. Although some changes are attributable to modifications in the federal requirements governing Eisenhower programs, many are not. Perhaps the annual turnover of the IHE Eisenhower program coordinator accounts for these other changes.

Table 2: Arizona RFP Specifications for IHE Eisenhower Programs

Section of RFP from 1991-92 Competition: Phase I	1991-92 Competition: Phase II	1992-93 Competition
Introduction	**Change from previous cycle**	No change from previous cycle
Solicitation of Proposals (i.e., types of projects sought)	**Change from previous cycle**	**Change from previous cycle**
General Information	**Change from previous cycle**	**Change from previous cycle**
		***NEW* Section 4: Conditions Covering All Awards**
Funds Available	No substantive change	No substantive change
Eligible Applicants	No substantive change	No substantive change
Format for Proposals	**Change from previous cycle**	**Change from previous cycle**
Submission of Proposals	No substantive change	No substantive change
Evaluation/Selection Criteria	No change from previous cycle	**Change from previous cycle**
Approval and Announcement	No substantive change	No substantive change
Contacts for Additional Information	No substantive change	No substantive change

NOTE: No change from previous cycle = Same wording; No substantive change = Same intent; Wording changes to update annual information (e.g., federal allocation); Change from previous cycle = Substantive modifications in wording and/or intent

As the shaded areas in Table 2 illustrate, substantive changes to key elements of the RFP have been made for the past three funding cycles. These include the kinds of programs sought, general information, and the proposal format. Furthermore, a major shift occurred between the last two RFPs in terms of the criteria used to evaluate proposals (see Appendix G for further information).

Twice in the last three funding cycles, the Board has distributed RFPs in the spring/summer for an October submission deadline. Applications were sent to research offices of all public universities and

community colleges, math/science personnel within the community colleges and universities (private and public), past Eisenhower recipients and proposal submitters, and others who have expressed interest in the Eisenhower program. Proposals were reviewed in November/December, for project start-up beginning in January or thereafter. In one of the funding cycles, programs were approved for periods up to 24 months. The most recent 1992 competition, however, stipulated a nine-month funding period (i.e., January through September of the same year).

The 1991-92 Phase I competition represented a departure from the cycle described above. In this competition, RFPs were distributed in the spring for a July submission deadline, August review, and fall start-up.

The combination of historical lack of program continuity, changes in federal guidelines, and recent shifts in Arizona's K-12 approach to mathematics and science education, has prompted a number of questions about the use of IHE Eisenhower funds in the state. The following analysis, however, is generally intended to reveal elements of a "good" state-level IHE Eisenhower program.

Project Questions and Answers

For the purposes of this section, information obtained as a result of the variety of databases described earlier in this chapter (cf. **Methodology of the Project**) will be synthesized in order to answer a number of key research/policy questions. (Detailed analyses of these databases are contained in Appendices B through I and are referenced throughout the discussion that follows.) The questions are:

- What kinds of programs and practices should be promoted within the scope of Arizona's IHE Eisenhower program?
- How should the Arizona Board of Regents modify its procedures for administering the grant competition in order to promote these kinds of programs and practices?
- How can the Arizona Board of Regents identify--and strengthen the dissemination of--"what works" in mathematics and science education and training?
- What other strategies should be adopted by the Arizona Board of Regents to strengthen the IHE Eisenhower program?
- What should be the relationship between the IHE Eisenhower program and other K-12 education reform efforts in the state?

► What kinds of programs and practices should be promoted within the scope of Arizona's IHE Eisenhower program?

Nationally, Eisenhower programs have played an important role in supporting "innovative programs of national significance that will improve the quality of teaching" in mathematics and science and in increasing student access to instruction (Fort, 1993). This is no less true in Arizona. Arizonans interviewed as part of this project said they wanted institutions of higher education to work collaboratively with K-12 teachers to provide expertise, resources, and innovative ideas that will strengthen mathematics and science education in the state (Appendix C, Part II).

A perceived strength of Arizona's IHE Eisenhower funds is that they *do* support innovation. Student and teacher training programs emphasize a diversity of topics that reflect state-of-the-art pedagogical techniques and content in mathematics and science (Appendix H). According to those interviewed, the specific content of IHE Eisenhower programs has been, and should remain, at the discretion of program proposers (Appendix C, Part II).

Beyond the specific content of Eisenhower programs, there are a number of cross-cutting issues related to the kinds of programs and practices that need to be promoted within the scope of the Arizona IHE Eisenhower program. These issues concern:

- the types of programs allowable by law
- LEA involvement in program operations
- services to underrepresented groups
- business and industry partnership programs
- services to elementary and middle school participants
- program quality

Each of these issues is elaborated upon in the following discussion.

Types of programs

As noted, federal regulations allow two general categories of programs: 1) cooperative programs, which may be described as student-oriented, and 2) teacher-oriented preparation and enhancement programs which include traineeship programs for new teachers, retraining programs, and in-service training for elementary, middle, secondary, vocational school teachers, and other appropriate school personnel. While Arizona's IHE Eisenhower program has funded both student and teacher-oriented projects, a vast majority of Arizona's IHE programs have provided in-service training (Appendix H).

This appears to be true, in part, because no clear distinction has been made between different types of allowable programs in Arizona's solicitation of proposals. Cooperative programs and the three subtypes of teacher preparation and enhancement programs (i.e., training, retraining, and in-service) are typically all listed together as kinds of programs solicited in Arizona's RFP (cf. Appendix G). The lack of distinction between student-oriented and teacher-oriented programs has contributed, at least in part, to a perception that programs are funded on a "hit-or-miss" basis. Many Arizonans involved in the Eisenhower programs have voiced concerns over "hidden agendas" in funding, not knowing clearly the types of programs being solicited (e.g., "Guidelines need to be clarified--they bounce around....I think that there are hidden criteria that are not published..."; cf. Appendix C, Part III).

Clarification would help applicants understand that *both* cooperative programs and teacher preparation and enhancement programs are important. Several other states have focused attention on these different programs through "categorical funding": one category supports cooperative programs that provide direct student services as well as teacher training, and another category supports teacher preparation and enhancement programs (e.g., Colorado, Nebraska, Texas; cf. Appendix F). Categorical funding has proven to be effective in promoting both cooperative and training programs.

Within the categorical funding model, a distinction could be made between the two types of allowable programs by funding cooperative programs on a multi-year and non-competitive basis following an initial

grant. This practice has been adopted in several other states (Appendix F) and reflects a recommendation by the Council of Chief State School Officers (CCSSO) that at least 20 percent of the IHE monies allocated to a state should directly support cooperative programs on a non-competitive basis (Appendix B, Table B-1).

LEA involvement

Data suggest that Arizona should strengthen its enforcement of the federal requirement that IHEs link with a local educational agency (LEA). In analyzing project descriptions for the past three years, it is clear that there is little evidence that cooperative planning, implementation, and evaluation exist between LEAs and IHEs. In a majority of cases, linkages are manifest only through a "letter of support" by an LEA. One of the major criticisms by out-of-state proposal reviewers was that this was insufficient evidence of school district commitment to Eisenhower projects (cf. Appendix E). Moreover, many of the Arizonans interviewed felt that more local input was needed in defining program services (cf. Appendix C, Part II). The proposed Arizona State Systemic Initiative would address this need by requiring LEAs to develop "local systemic plans" (Appendix B).

Strengthening LEA involvement in Eisenhower programs can be viewed as an important part of Arizona school reform efforts (cf. Appendix C, Part I, Figure C-1). In the words of one consultant, math and science instruction and teacher training can no longer be viewed simply as "one more added piece of the 99 they already have." Local districts must examine their own math and science instruction and teacher training programs in terms of long-term program improvement goals. Stronger evidence of local planning would help meet one of the six criteria of program quality endorsed by the U.S. Department of Education and reflected in the Excellence in Mathematics, Science and Engineering Education Act of 1990--that of linking Eisenhower programs with long-term improvement goals.

Data suggest that IHE Eisenhower programs can strengthen LEA involvement in several ways. School-based projects can be encouraged, with provisions for stronger evidence of collaborative program planning and implementation. Notification of IHE Eisenhower grants can be sent directly to LEAs, with a request to initiate proposals at the local level prior to soliciting the participation of an IHE partner. LEA matching funds can be required as evidence of an LEA's commitment to implementation. LEA representation on the grant selection panel can be established.

Emphasis on underrepresented groups

As previously noted, Eisenhower programs have historically focused on recruiting not only students from underrepresented and underserved groups, but also teacher trainees who represent and/or serve these groups *including* females, minorities, individuals with limited English proficiency, the handicapped, and migrants. In Arizona, the primary emphasis has been on *ethnic minority* students and teacher trainees, with lesser consideration given to recruiting teacher trainees who serve ethnic minority students. Only in the most recent RFP has *any* reference been made to serving students from other underrepresented groups such as females, handicapped, and migrants (cf. Appendix G, RFP, Section 2).

While the Arizonans interviewed supported efforts to improve access to ethnic minority students and to recruit ethnic minority teachers, several expressed concern over the apparent emphasis placed on ethnic minorities at the expense of other underrepresented and underserved populations. For example, one interviewee noted:

> "...while I understand that there's a reason for addressing underrepresented populations in terms of ethnicity, there's another underrepresented population and that's the population of low-income kids. ...it seems to me that underrepresentation needs to include not just ethnically underrepresented, but *all* underrepresented groups and, in my view, that includes low-income areas. So I think projects that target schools that...are clearly low-income schools that may not have the large ethnic populations is still a good use of money" (Appendix C, Part III).

Furthermore, some respondents noted a shortage of ethnic minority teachers available to recruit--a fact substantiated earlier in this report. As one interviewee noted:

> "From my perspective, if they would not target minorities, it would be stronger because you...can go with the most excited teacher, the most supportive school, if that's the approach you want to use" (Appendix C, Part III).

Arizona's obvious intent in placing emphasis on ethnic minorities is to solicit proposals that focus on minorities. The question is: Has this purpose been served? The answer is yes and no. On the one hand, programs have undoubtedly trained teachers who work in schools with large percentages of ethnic minority students. For example, Northern Arizona University primarily works with teachers who serve Native American populations; the University of Arizona emphasizes the Hispanic community in its proposals; and Arizona State University makes reference to a number of different ethnic groups (e.g., inner city minorities) in its proposals. On the other hand, only two of the 30 programs funded over the past three years have *explicitly* and *exclusively* targeted ethnic minority *teachers* (Appendix H, Table H-2). This suggests that at least one intent of Arizona's RFPS--the strengthening of mathematics and science skills among Arizona's minority teachers--has not been well-served by IHE Eisenhower programs.

It is important to note that in the federal regulations governing Eisenhower programs, ethnic minorities are listed as only one example of underrepresented and underserved groups--not the only group to be served. But Arizona's focus on ethnicity has tended to discourage some other potential proposers from applying for grant monies. Said one interviewee, "If [a proposal] doesn't involve minorities, forget it!" Said another: "The rules should be as broad as allowed by federal law. Things allowed by the Feds are arbitrarily left out of the RFP" (Appendix C, Part III).

Interviewees suggested that the language used in Arizona's RFP to solicit proposals should be broadened to place equal emphasis on *all* underrepresented groups allowed by federal guidelines. For example, this language should allow Arizonans to go beyond the groups listed as examples in the federal guidelines and identify additional groups they consider to be underrepresented (e.g., low income children).

Some interviewees, however, felt that the state should maintain its attention on ethnic minority participation. According to Arizonans interviewed, effective strategies for recruiting minorities include such things as using minority teachers to recruit participants and requiring at least one-half of the participants to be in Bilingual Education (Appendix C, Part II).

Business and industry partnerships

According to federal guidelines, IHEs are encouraged, but not required, to develop partnerships with business and industry. In Arizona's IHE programs, business and industry partnerships have *not* been highly visible. In a survey of teacher-trainees involved in IHE Eisenhower programs, those kinds of partnerships are the lowest rated feature of Eisenhower programs (Appendix D).

A rationale for encouraging business and industry partnerships was provided in Part I of this report: The workplace increasingly demands a mathematically and scientifically competent population, and businesses are often in the best position to help schools identify the skills and levels of training needed to prepare students for the world of work.

Many interviewees stated that the Arizona Board of Regents should continue to encourage--but not require--business and industry, or "non-education," partnerships. The Board may wish to promote partnerships through action that follows, in part, the intent of one of the CCSSO recommendations: a broadening of cooperative programs to include entities such as "museums, science and technology centers, zoos, and other agencies that provide professional development support to educators" (Appendix B, Table B-1).

Elementary and middle school participation

The federal emphasis on targeting elementary and middle school teachers has generally been reflected in Arizona's RFPs. It appears to have worked effectively. Teacher-trainee participants agree that programs have served these populations (Appendix D), and an analysis of 30 programs over the past three years shows that a majority (80 percent) have targeted participants at these grade levels (Appendix H, Table H-3). Interviewees felt that maintaining emphasis on these groups is appropriate.

Promoting program quality

As noted earlier in this report, IHE applications are now required to "provide evidence that the training activities it proposes to implement are of high quality and sufficient duration to promote a lasting and positive effect on teacher performance" (Federal Register, Vol. 57. No. 99, Thursday, May 21, 1992, p. 21711). The U.S. Department of Education recommends that states, LEAs, and IHEs develop their professional training strategies using its six criteria of program quality as guidelines. These criteria address the program's relationship to long-term improvement goals and teacher classroom assignments, and how well the program provides follow-up, involves professional teams, has LEA administrative support, and allows for integration into understanding and implementation.

Arizonans involved in math-science education expressed diverse opinions on the extent to which these six criteria of program quality are manifest in Eisenhower programs (Appendix C, Part II). In contrast, a survey of K-12 teachers involved in Eisenhower programs indicated a consensus opinion that the quality criteria have been met (Appendix D). Of the six criteria, however, these K-12 teachers had the least agreement regarding whether training programs involved professional teams or provided follow-up activities (Table 3).

Table 3: K-12 Teacher Ratings of "Program Quality" Criteria (N = 23)

Program Quality Criteria	Average[a]	Rank
1. The program was related to my school's long-term improvement goals for math-science education.	1.59	4
2. Training activities were sufficiently intense to allow for integration into understanding and implementation.	1.41	2
3. Training activities were related to classroom assignments.	1.57	3
4. Training activities included professional teams (rather than individuals).	1.86	6
5. The program provided follow-up or reinforcement activities or both.	1.73	5
6. The project had the administrative and policy support of my school.	1.36	1
[a] Items were rated on a 4-point scale from 1 (Strongly Agree) to 4 (Strongly Disagree).		

Eisenhower program directors discussed some of their difficulties in meeting the six criteria. They noted difficulty in such things as obtaining LEA input related to school-based goals; short-term funding cycles that inhibited integration, follow-up, and reinforcement; and, lack of support from some LEA administrators.

In discussion of professional teams, several interviewees provided a rationale for *not* using teams. They said that too much time can be invested in forming them only to have them break apart:

> "If you get a team from a school, you probably have a bigger opportunity in that one school to make an impact for awhile. Teachers are still mobile though. That is our whole problem. If you start saying we want a team, you get a team, then they move away" (Appendix C, Part II).

Nevertheless, many Eisenhower grant recipients--past and present--were quick to cite the advantages of program elements specified in the six criteria of quality. They noted, for example, that implementation is easier when using relevant, hands-on lessons and materials, and that school-based implementation of training is better when teams from the same school participate (Appendix C, Part II).

► How should the Arizona Board of Regents modify the IHE Eisenhower grant competition in order to promote desirable programs and practices?

Answers to this question are derived largely from an analysis of interview data regarding the role of the Arizona Board of Regents in administering the grant competition (Appendix C, Section III). Three topics are addressed in this section:

- distributing the request for proposals
- the RFP document
- the grant application review process

Distributing the request for proposals

Two issues surfaced regarding "getting the word out" to potential IHE Eisenhower proposers. The first involves the length of time between when RFPs are sent out and the submission deadline, while the second focuses on decisions as to who receives the applications.

Several respondents felt that there was not enough time to respond to the RFP. According to one, "The RFPs come out very late....I think you need more time than that to just think through the structure.... Maybe if you're on the 'in,' then you'd know when these things are coming out and you could prepare. But how you get in that position, I don't know."

But a majority of respondents either did not note any problem, or felt that the "lead time" to respond was adequate. Said one, "The time frame is adequate--most people do it during the last two weeks anyway."

Regarding the dissemination of RFPs, several respondents felt that a broader audience should be targeted.

> "I can always find them [RFPs] because I know when they're coming out, and I start calling around....But then, that's the case of the ones that are involved in it and they're always the ones that know about when they should look for it. I think you could disseminate RFPs to a larger audience that might be connected, and some school districts might actually form together types of consortiums that might apply for those. And then I would like them [LEAs] to contact higher education institutions...instead of higher education institutions contacting the LEAs and things like that. I think what I'm trying to say is probably a broader range of dissemination would be useful--that you might get a diverse set of proposals written."

> "[ABOR] should really concentrate on new awardees. There is certainly some need to go to the universities, but I think some more might go to the community colleges and then to some other organizations...who are doing a fabulous job with teacher training and working in math and science. I think they need to extend their bases--their boundaries for giving awards."

Data suggest several other ways by which ABOR could strengthen its distribution process. One action would be to adopt a *consistent* time frame for the grant competition. The experience of external reviewers (Appendix E) and other states (Appendix F), is that many Eisenhower programs use the same annual funding cycle, with a single RFP. As noted earlier in this report, Arizona has altered over time its distribution/funding cycle and its RFPs. Data suggest that a broader dissemination of an annual RFP--issued at the same time each year--could eliminate the perception of having only select IHEs or IHE personnel being "on the in." It would also encourage proposal submissions from a larger audience of eligible recipients.

The RFP document

Although some respondents felt Arizona's RFP is adequate and representative of RFPs in general, most did not. Some criticism focused on the document as a whole:

> "I thought about submitting a proposal this year and didn't. It seemed to me that the list of regulations and do's and don'ts has gotten much longer....I felt that it wasn't worth the effort to apply--there was such a long list. It seemed like such a complicated process--I mean it was as bad as filling out a 1040 form with all kinds of deductions and things. I can see how someone would say that 'Gee, this isn't worth the trouble.'"

Other criticism was leveled against specific aspects of the RFP. Respondents commented on the lack of clarity in the solicitation of proposals, heavy emphasis on minority participants, the constraints of the most recent nine-month funding cycle, and poor project evaluation requirements (Appendix C, Part III). External reviewers commented on many of these same aspects of Arizona's proposals, citing a lack of clarity of project justifications, poor instructional and management plans, "weak" budgets, and unfocused evaluation designs (Appendix E). An analysis of the last three Arizona RFPs tends to support many of these charges and points out the lack of consistency over time (Appendix G).

For example, the most recent RFP (FY 1992-93) adopted selection criteria based on a point system, such as that used in Texas. Although this is typical of many federal and state RFPs, it represented a departure from previous IHE Eisenhower RFPs in which the selection criteria were stated but had no correlative rating scale. Several respondents said that a rating scale, or point system, is desirable in communicating to proposal writers the relative significance placed on various aspects of the proposal, but they felt that the most recent RFP was flawed because the selection criteria did not parallel the required proposal narrative (i.e., within the "Format for Proposals" section of the RFP). This gave rise to considerable concern among proposal writers, as illustrated by the following comment:

> "Any wide range of guidelines would be suitable to the sort of project I see as suitable for ABOR. The only stipulation, and I feel an imperative, is that there is a one-to-one match between published guidelines and selection criteria employed by the panel. In the past, there have been [serious] discrepancies in this area."

Arizonans interviewed also indicated a number of weaknesses in local-level program evaluations that might be avoided through more clearly defined guidelines in the RFP. Local program evaluations were considered to have an inadequate definition of goals and objectives, lack of expertise in evaluation and methodology at the LEA level, and inappropriate time constraints in implementing evaluation designs considered appropriate (i.e., longitudinal studies) (cf. Appendix C, Part II).

Several interviewees felt that the Arizona Board of Regents' expectations for evaluation are unclear and contribute to the problem. Respondents recommended that the Board be specific and set evaluation standards. Other suggestions included setting clear standards for either an "outcomes" or "process" evaluation, or both; providing sample models of evaluations in the RFP; and not awarding grants unless the evaluation design is adequate.

In final reference to the RFP, external proposal reviewers suggested that Arizona model its RFP after successful ones used in other states. Another suggestion was to develop an RFP checklist for use by proposal writers and reviewers (Appendix E).

The grant application review process

A major area of dissatisfaction among Arizona stakeholders centered on the composition of the review panel and process used to evaluate proposals and award grants. Criticisms were leveled against:

- the composition of the panel

  > "You need a grouping of diverse areas...which means that in RFPs, it might say these proposals are going to be evaluated by a team of this make-up: university content specialist, community college people, teachers, or whatever you get from them."

- the amount of decision-making authority of the IHE Eisenhower program director

  > "I would limit the director's discretion. I don't know how much it's used, but I think it should be clear as to how much discretion can be exercised in-house."

- the involvement of the Board in the process in general

  > "What the Board should do is set up general policy guidelines. They should not be involved in the process at all. They should put together a committee and give it the proper guidelines as to what the money should be used for. The committee should be in charge of dissemination and enforcing the evaluation requirements. That would be a proper role for the Board."

Several respondents, from different institutions, recommended that an external agency monitor the review process:

> "Another area that I think is real critical is that they [ABOR] set aside money in there to hire [somebody] to be the watchdog of the evaluation."

> "Whenever you've got big money, and this is big money, then there's entanglements. Somebody needs to be a watchdog, I guess."

Respondents did *not* agree on whether or not reviewers should be from out-of state. While some felt that out-of-state reviewers might be advantageous (e.g., "...you don't want friends of submitters to be evaluating proposals"), others pointed out that "...the further you get from the state, the further you get away from the needs of the area."

In reviewing the composition of other state's evaluation/selection panels, it is clear that a variety of models are used (Appendix F, Table F-3). California, for example, draws upon reviewers who represent business/industry, consultants, government agencies (e.g., National Park Service), IHEs, K-12 teachers, and members of the state agency for education that administer K-12 Eisenhower monies. Colorado focuses heavily on what it describes as a "consumer-based" selection committee, using primarily K-12 teachers as reviewers. The most common model is an evaluation panel comprised of representatives of institutions

of higher education drawn from around the state. (This is the model that has, historically, drawn criticism in Arizona.)

Interview data suggest that the almost any composition of the panel will suffice as long as two standards are met. First, proposal writers should be aware of the people who will be reading and rating their proposals. Second, panel procedures need to be consistent over time and guarantee equitable treatment for all proposals. As suggested by out-of-state panel members, the Board should provide some training for proposal reviewers prior to their involvement in the selection process (cf. Appendix E).

► **How can the Arizona Board of Regents identify and strengthen the dissemination of "what works" in mathematics and science education and training?**

Some interest has been expressed in improving the dissemination of information about "what works" in mathematics and science education throughout the state. In light of this interest, Morrison Institute analysts investigated how current Eisenhower grant recipients disseminate information about their programs, the kinds of dissemination activities most beneficial to them, and their suggestions for improving the dissemination of information about "what works" in mathematics-science training and education.

In order of importance, dissemination activities perceived as most beneficial by past and present Eisenhower grantees include professional meetings, organizations, and conferences; networking, or one-on-one exchanges of information; publications; and local workshops. Presentations, particularly at meetings of national and/or state associations, were the most prevalent means of disseminating projects and results. Among the specific groups that were noted for holding valuable meetings were the National Science Foundation, American Association for the Advancement of Science, Arizona Science Teachers Association, and Arizona Association for Bilingual Education. Formal presentations and publications in the journals of these organizations seem to be one common way to "get the word out."

Other methods of dissemination were cited as having both positive and negative aspects. Networking, for example, was not perceived as entirely positive because of "poor communication"--even among program directors on the same campus (Appendix C). And, though several respondents mentioned both professional and program-generated newsletters as of value, program-generated newsletters were said to be difficult to produce because of limited funds.

Many project directors agreed that it would be helpful to disseminate more information about Arizona's IHE Eisenhower programs. Suggestions for doing this included the following:

- improve dissemination at state-level meetings
- require projects to submit articles for publication
- create a speakers bureau
- improve electronic communication (e.g., using E-mail; databases)
- develop publications/newsletters/catalogs

External reviewers felt that Arizona might benefit if stronger dissemination plans were required of all IHE projects. For example, all project directors might be required to submit a presentation for a state math-science conference (Appendix E). This is one way that other states disseminate information at the state level--by sponsoring or co-sponsoring a meeting compatible with their funding cycle. These meetings

offer presentations by completed or on-going projects, and an opportunity to conduct a pre-conference proposal writing seminar or workshop for new project proposers. State conferences also provide networking opportunities.

► What other strategies should be adopted by the Arizona Board of Regents to strengthen the IHE Eisenhower program?

Regarding the overall administration of the IHE Eisenhower program, the biggest topic of conversation among Arizonans interviewed was the lack of continuity due to annual changes in personnel. The Board recognizes this problem and is taking steps to rectify the situation. Other strategies to strengthen the Eisenhower program that emerged from an analysis of the data include:

- the provision of technical assistance
- state-level program evaluation.

Technical assistance

Specific needs for technical assistance were mentioned by Arizona and out-of-state reviewers alike. These needs include assistance in the areas of developing and writing grants, designing local evaluations, and providing feedback on unsuccessful proposals (Appendix C, Parts II and III; Appendix E). For developing grants, Arizona may wish to adopt a strategy enacted by several other states: a pre-proposal workshop that assists potential grantees in preparing their grant applications (cf. Appendix F, Table F-2). One interviewee also suggested that the Board consider maintaining a grant-writing "hot line" (e.g., "[One year] they had a telephone networking to answer questions about successful grant writing--I found it very useful, most of it. I thought it was very well done."

Arizonans interviewed offered many specific recommendations for state-level technical assistance in evaluation:

- expertise should be provided in evaluation methodology
- evaluation experts should be provided as consultants
- workshops on evaluation methods should be provided at the university level
- names of contact people who would serve as resources should be provided
- a university campus evaluation unit should be established

Also, several Eisenhower participants said that feedback on unsuccessful proposals would be valuable technical assistance.

State-level evaluation

While external reviewers commented on the need for Arizona to strengthen evaluation at the state level (Appendix E), Arizonans interviewed expressed diverse opinions on the need for state-level evaluation (Appendix C, Part II). One faction among those interviewed felt that state-level evaluation is "futile" and of little value. Others, however, felt that state-level evaluation is necessary. Regardless, the important point is that in order for Arizona to reapply for federal Eisenhower funds every three years, *some* evaluation is essential. The question is, then, "What can be done to strengthen state-level evaluation?"

Interviewees expressed concern over the type of data currently required for state-level program evaluation:

> "It was very difficult to do the evaluation--just trying to find out what to fill out. I think it was more annoying than anything else. That was very unclear. You lose a lot of respect for the people involved at the Board if their documents are not well put together. That's just a recent thing."

> "They have this form for the evaluations. If they are going to request specific data on your program on that form, it would be nice if they sent you that form more than 30 days before they want it back because you can't collect the data after the fact. They wanted a lot of breakdowns on the number of minority students that teachers have. [Teachers] don't have these numbers on their kids. I understand where [the Board is] coming from, and I understand we need to pay attention to it, but it does nothing in terms of whether it is a good program. It takes a tone of --'time to break the information out that way.' And it's not telling them a thing. It's giving them numbers that they can pass on to Washington, because they're also tracking numbers of minorities. Tracking numbers doesn't make it a good program. And it's time-consuming. I don't think it tells them what they need to know except, well, the 'bean counters' who are tracking that way. ...I understand you want to know how many participants you have, but that's not really the important question" (see Appendix C, Part III).

Historically, the Arizona Board of Regents has collected similar information from each funded program, but there has been no systematic effort to analyze these data for the purposes of a state-level evaluation. Given that the data collection instruments currently used are complex and burdensome--and are not used--many interviewees felt that the Board should discontinue them. Regarding alternatives for state-level evaluation, Arizonans interviewed suggested that evaluators:

- focus more on "the overall policy" as a standard for evaluation
- involve site visits/case studies
- conduct a more formal evaluation study (e.g., meta-analysis; experimental design) to determine what works
- summarize "real data" from local program evaluations (as opposed to questionnaire results)
- report progress on Arizona's *Essential Skills* and Arizona Student Assessment Program (ASAP) results as measures of program success at the state level

Finally, one person noted that a state evaluation should, in essence, serve as part of a statewide needs assessment: "I think we need to take a look and put the effort where the weaknesses are. And that's not hard to tell. The testing programs will tell that. And what's interesting is that those are not the places where the grant monies are going."

► What should be the relationship between the IHE Eisenhower program and other K-12 education reform efforts in the state?

Part I of this report notes that Arizona's K-12 education system is changing. Changes are partially attributable to newly adopted curriculum standards (i.e., Arizona's *Essential Skills*) and a performance-

based assessment system (i.e., Arizona Student Assessment Program). Changes are also occurring in response to national reform efforts, such as those that encourage "restructuring" initiatives. In the fields of mathematics and science education, technological advances are compelling educators to upgrade their content knowledge and expertise in order to avoid teaching skills that are obsolete.

Across the nation and in Arizona, unsatisfactory student outcomes and tight economic conditions are prompting educators to look for new ways to improve education through a better use of existing resources. This, in fact, is one of the major intents of the *High Performance Learning Act* proposed by the Council of Chief State School Officers (Appendix B).

In light of national and state reform efforts, IHE Eisenhower programs can no longer afford to be viewed as "one more piece." Rather, IHE programs must be viewed in the context of holistic reform efforts. In Arizona, the most ambitious and significant reform effort in mathematics and science was proposed in the state systemic initiative which, in May 1993, was turned down for funding.

During Phase I research, interviewees were asked to comment on how IHE Eisenhower grants might be able to strengthen math-science education in grades K-12 within the context of the state systemic initiative. One-fifth of the respondents (21 percent) expressed a lack of familiarity with the proposed plan. Other interviewees who were familiar with Arizona's SSI proposal were unclear about its status and acknowledged a lack of understanding as to what activities had finally been proposed.

Of those responding who were familiar with Arizona's SSI, many felt that IHE funds had potential to reinforce or strengthen SSI-endeavors. However, the overall tone of the interviews was that the IHE program should remain administratively autonomous from SSI activities. This view emerged as a result of concerns about the practical operation of Arizona's SSI plan, even if fully funded by the National Science Foundation (cf. Appendix C, Part IV).

Prior to being informed that Arizona's proposal was *not* funded by NSF, Morrison Institute analysts prepared recommendations for a "contingency plan" for using IHE Eisenhower monies in concert with state systemic initiatives. Coordinating IHE and SSI efforts made sense given that the proposed SSI called for initiatives parallelling the intent of IHE Eisenhower funds. That is, the SSI plan sought to improve both: a) *teacher enhancement* through establishing state-certified teacher training centers and summer academies, and b) *teacher preparation* through strengthening preservice education within the state's public universities (cf. Appendix B).

In order to qualify for state certification as a teacher training center, the SSI proposed that "at least 40 percent of the program budget should be from in-kind, *higher education Eisenhower grants*, local school Eisenhower funds, or private funds." Regarding preservice, the SSI proposes offering universities "financial incentives to develop 'break the mold' models of teacher preparation" *supported by higher education Eisenhower funds*.

Regarding the integration of Eisenhower Funds with SSI programs, the SSI proposal suggested the following:

> "For Arizona's SSI to succeed, schools and school districts will need to coordinate the development of their systemic plans with the application and funding cycles of the local Eisenhower program. Equally important, *the review of training center plans must be*

> *coordinated with the application and funding cycles of the higher education Eisenhower program.* As for state Eisenhower funds, we will use these to conduct leadership training for academy and training center faculty. ...In this way we will articulate systemic plans, training center plans, and leadership training with Eisenhower programs. This will allow us to integrate local, state, and higher education Eisenhower funds with the resources of NSF, business, and industry" (see Appendix B).

Several preliminary recommendations were developed to strengthen coordination between IHE programs and proposed SSI initiatives. Once informed that the SSI proposal was not accepted, Morrison Institute analysts requested the assistance of a group of key respondents to help revise these recommendations. The intent was to propose recommendations that would serve to strengthen interagency collaboration and coordination (e.g., between ADE and ABOR) independent of SSI initiatives.

Decision-Making in the Context of Change

Based upon the preceding discussion of study results, nine key recommendations were developed for the Arizona Board of Regents. These recommendations encompassed 52 separate strategies for strengthening the administration of the IHE Eisenhower program and improving deployment of IHE monies. These preliminary recommendations were presented at a meeting of 24 key mathematics and science specialists/educators for their reactions and revisions.

Working in small groups, this panel of experts reviewed each proposed recommendation and determined an appropriate course of action such as adopting, modifying, deleting, or adding a recommendation. All accepted recommendations were rated as either "essential," "highly desirable," or "optional." Small group recommendations were presented to the entire group for discussion and reaction. Group decisions were made with the understanding that Morrison Institute analysts would ultimately be responsible for final recommendations made to the Arizona Board of Regents. Part III presents the results of this analysis, while Appendix J contains the complete list of recommendations made by the assembled panel of experts.

PART III

Improving Arizona's IHE Eisenhower Program

In the spring of 1992, the dynamics of national and state math-science reform efforts prompted the Arizona Board of Regents to request a study "to improve the development and dissemination" of grants funded by the Dwight D. Eisenhower Mathematics and Science Education Act. This act gives Arizona more than one-half million dollars each year to provide student and teacher training programs in math and science. These funds are awarded to institutions of higher education through a competitive grant program administered by the Arizona Board of Regents. Morrison Institute for Public Policy, School of Public Affairs, Arizona State University, was contracted to produce a strategic plan to improve deployment of Eisenhower higher education funds.

To lay the groundwork for the strategic plan, Morrison Institute analysts conducted a study that involved an extensive review of the literature, attendance at state-level meetings that addressed mathematics and science reform, and both in-depth individual and focus group interviews with key stakeholders in the state. The study also elicited feedback from past and current recipients of Eisenhower grants on a) elements of their training and retraining efforts that have been successful or have proven problematic, and b) the Arizona Eisenhower grant proposal process and evaluation requirements. Reactions were also sought to national and state-level reform initiatives relevant to the teaching of mathematics and science. These same issues were explored with K-12 practitioners, teacher educators, university mathematicians and scientists, and business and industry representatives.

Although the context of mathematics and science education, training, and legislation is constantly evolving, this study has identified certain unchanging attributes that indicate a "good" state-level IHE Eisenhower program. These attributes are:

- consistent leadership that maintains program continuity over time
- a well-defined process for distributing funds including a logical funding cycle, good communication of grant availability, a coherent RFP, and an unbiased review process for assessing the merits of proposals and awarding grants
- state-level evaluation systems for both accountability and program improvement purposes
- student and teacher training programs that embody the best of what national research has to say about "effective" practices in mathematics and science education
- support services for IHE Eisenhower grantees to assist them in improving mathematics and science education and training
- interagency linkages to ensure program coordination with K-12 and other significant state-level reform efforts

Strengthening Program Leadership

Strong leadership is necessary to maintain program continuity over time. Unfortunately, the annual turnover of Eisenhower program administrators at the Arizona Board of Regents (previously noted in Part II) has been conducive neither to good communication nor to program development and improvement. ABOR has already recognized the need to establish a permanent "Eisenhower Program Coordinator," but at present the Board is advertising this job as only a quarter-time position.

A great deal of uncertainty exists over whether a quarter-time position would attract a quality program manager who could maintain administrative continuity over time. Arizona's math-science community would like to see this administrator's main focus be the improvement of mathematics and science education and training. It was recommended, therefore, that the Board assign the day-to-day duties of IHE Eisenhower program coordination to a full-time state employee, preferably one at the Arizona Department of Education (ADE). At least one other state (i.e., Idaho, cf. Appendix F) has made such a move.

For Arizona, assigning the day-to-day duties of IHE program administration to an ADE employee (e.g., the K-12 Eisenhower program coordinator) makes sense because it would help improve interagency communication and help coordinate LEA and IHE Eisenhower programs (e.g., in distributing IHE program information in concert with LEA funding cycles, thus providing better coordination of training and funds between IHE and LEA partners). Furthermore, such an arrangement would be in line with recommendations of the CCSSO (Appendix B) regarding joint planning for the use of Eisenhower monies. Such joint planning could incorporate elements of the Arizona State Systemic Initiative at the discretion of ADE and ABOR.

Several strategies could be employed to ensure that the Board retains authority over the use of funds. For example, the IHE Eisenhower program coordinator could submit quarterly reports to the Board's associate director for academic programs. The Board, independently or jointly with ADE, could appoint an "Eisenhower Advisory Committee" or "Arizona Mathematics and Science Steering Committee" to oversee the joint planning and coordination of *all* Eisenhower funds (cf. **Strengthening Interagency Linkages**, Recommendation #9). Or, a member of the Board could serve regularly on the proposal review panel--provided that this member is *not* the Eisenhower program coordinator (cf. Recommendation #5.2).

Delegating the administration of the IHE Eisenhower program to a full-time state employee could result in another benefit. It could allow reallocation of ABOR's Eisenhower administrative funds to support other activities and support services recommended in this report.

RECOMMENDATION #1: **Assign the day-to-day duties of administering the IHE Eisenhower program (for one-quarter time) to a permanent, full-time state employee with expertise in mathematics and science training and educational issues and programs.**

Defining a Process for Distributing Funds

At least four elements comprise a well-defined process for distributing funds. These include: 1) a logical funding cycle, 2) good communication regarding grant availability, 3) a coherent RFP, and 4) an unbiased review process for assessing the merits of proposals and awarding grants. As discussed in depth in Part II and Appendix C of this report, Arizona's math-science community has concerns in all of these areas. Recommendations for strengthening each area follow.

► Funding cycle

An Arizona panel of experts endorsed a recommendation that the state revise and institutionalize its annual funding cycle. This was judged to be essential for improving deployment of IHE monies. In making its recommendation, the panel reviewed a large number of suggestions derived from interviews and document analyses. These suggestions addressed such things as categorical funding, funding cycles, project time lines, grant amounts, and LEA matching funds.

Considered by the panel to be of primary importance was alignment of the schedule for IHE Eisenhower program funding with that of LEA Eisenhower funds. At present, such an alignment would be difficult. ADE's Eisenhower program operates on a July 1 through June 30 fiscal year, while ABOR's Eisenhower program operates on an October 1 through September 30 fiscal year. Thus, the Arizona Department of Education typically notifies LEAs of the availability of funds in March, requires LEAs to submit three-year plans for the use of funds by mid-May, and begins funding July 1. In contrast, the IHE Eisenhower program usually makes a spring distribution of RFPs, requires submissions by an October deadline, and starts funding in January.

The Arizona panel recommended a new funding cycle that follows the usual IHE pattern except that it specifies a fall rather than a spring distribution of RFPs. The panel further recommended flexible project starting dates (as indicated in individual proposals) with funding available as early as January, and with 18 month project cycles--two months longer than the current Arizona average of 16 months (cf. Appendix F). The panel also highly recommended two formal options for projects: 1) *no-cost extensions*, and 2) eligibility for *renewal* through participation in the next grant competition. The panel endorsed maintaining projects at a maximum of $50,000 per year (in keeping with the current annual average of $48,000 per year; cf. Appendix F).

While this report adopts the stance that IHE and LEA Eisenhower funding should be better aligned, Morrison Institute analysts are not in a position to prescribe the "best" funding cycle. Rationales for having projects begin at the onset of a school year match rationales for having cycles begin mid-year. Morrison Institute analysts do, however, endorse both longer funding cycles in order to maximize the impact of training, and maintenance of funding amounts as proposed.

RECOMMENDATION #2: Work in coordination with the Arizona Department of Education to revise and institutionalize an annual funding cycle congruent with LEA Eisenhower funding cycles.

2.1 Establish 18 month project cycles, with projects options for 1) renewal and 2) no-cost extensions.

2.2 Maintain project budgets at *a maximum* of $50,000 per year ($75,000 for 18 months; $150,000 for three years).

► **Communicating grant availability**

Currently, some in Arizona's institutions of higher education are not aware of the availability of IHE Eisenhower monies, or learn about these funds only after proposal deadlines have passed. Many LEAs also seem to be unaware that these funds may be used for teacher training. Considering that federal guidelines require collaborative efforts between LEAs and IHEs, this lack of knowledge is counterproductive.

The Arizona Board of Regents, therefore, should broaden the distribution of information and RFPs related to the IHE Eisenhower program. Combined with a stable annual funding cycle, this broader distribution of information would make Arizona's math-science community better aware of the availability and intent of Eisenhower funds.

To improve interagency collaboration and partnership programs, information about the IHE Eisenhower program should be developed and widely disseminated prior to the distribution of RFPs. This information should specify grant requirements, contacts, time tables, and any program factors that merit preferential funding. It should also make clear that museums, zoos, and other agencies may be partners, but they cannot substitute for an LEA. In addition, all non-IHE partners, including LEAs, should be informed that an IHE *must* be the primary agency to submit a proposal. As information is disseminated to non-IHE school districts and agencies, these *districts/agencies should be encouraged to collaborate with an IHE of their choice to develop a plan.*

The idea of broader dissemination raises the possibility that non-IHE interested parties may approach an IHE of their choice to develop a proposal. To facilitate such linkages, the Board should request that each IHE develop a list of key personnel within their institution whom non-IHE parties could contact for further information or to develop a collaborative proposal. In turn, these key contacts should automatically be added to the distribution list for RFPs.

RECOMMENDATION #3: Broaden the distribution of IHE program information and RFPs.

3.1 Develop informational materials (e.g., a promotional brochure or pamphlet) that describe the intent and nature of the state's IHE Eisenhower program, including the specifics of when RFPs/grants are available and from whom RFPs are available.

3.2 Distribute information about the IHE program to all state LEAs, museums, zoos, and other agencies representing potential partners in an IHE program.

3.3 Request each eligible IHE in the state (i.e., community colleges and universities; public and private) to develop a list of "key" liaisons/contacts to whom non-IHE personnel may be referred.

3.4 Distribute RFPs to each member of an IHE's newly-established list of liaisons/contacts, and to each IHE's grant office, chief academic officer, and other personnel currently on ABOR's mailing list.

► **Requests for proposals**

As noted in Part II and Appendix C of this report, Arizona's IHE Eisenhower request for proposals (RFP) is considered by many to have serious flaws. These flaws include the use of ill-defined terms and acronyms, unnecessary restrictions governing the solicitation of projects, internal inconsistencies and conflicting guidelines, and vague selection criteria. As a whole, therefore, the RFP requires considerable modification. Specific suggestions for strengthening the RFP are discussed briefly below. (Appendix J contains additional detail on specific items.)

Two types of programs are defined in federal requirements governing Eisenhower programs: 1) cooperative programs (which include direct student services), and 2) teacher preparation and enhancement programs. These two types of programs need better definition in Arizona RFPs. Other terms and acronyms used throughout the RFP also need to be more clearly and carefully defined (e.g., "capacity building").

As has been noted previously in this report, federal requirements call for IHEs to collaborate with one or more LEAs in the planning, implementation, and evaluation of programs. There is little disagreement that ABOR should require stronger evidence of LEA involvement in IHE programs than the currently accepted LEA "letter of support." But what constitutes acceptable evidence of an appropriate level of collaboration? The RFP should ask that proposals demonstrate LEA involvement and commitment in at least two ways:

- Proposals should thoroughly describe the collaborative effort and provide as much documentation as possible to demonstrate LEA involvement in the program (e.g., proposals should explicitly address school goals and the state *Essential Skills*).

- Proposals should include LEA or LEAs' matching funds and/or in-kind support, *in proportion to the LEA's ability to contribute* funds and support using their LEA Eisenhower allocations[3]. This serves as tangible evidence of LEA commitment to a proposed project.

The Board should consider giving preference to proposals that include either or both of the above components. To further promote LEA and IHE collaboration, the Board also should align the IHE funding cycle with the distribution of LEA Eisenhower funds (cf. Recommendation #2).

[3] As explained briefly in Part II (**An Overview of The Dwight D. Eisenhower Mathematics and Science Act**), LEAs receive Eisenhower allocations through formula funding based on student enrollment and eligibility for Chapter 1. Smaller schools may not be able to match IHE funds dollar-for-dollar or contribute significant in-kind support. Proposals including small schools/districts should not be penalized for failing to match funds as long as there is a "good faith" commitment of *some* funding and/or in-kind support.

Arizona's RFP needs to solicit proposals that address *not only* ethnic minorities, but also females, individuals with limited English proficiency, the handicapped, migrant populations, low-income populations, students and teachers in sparsely populated areas (i.e., rural populations), the gifted and talented, or any combination thereof. At present, ethnicity appears over-emphasized to the exclusion of other federally-targeted populations.

Certain current emphases in the RFP need to be maintained. For example, a past emphasis on elementary and middle school groups has been appropriate and should be continued. Moreover, non-education partnerships should continue to be encouraged. Regarding the latter, however, the RFP should adopt language that promotes such partnerships *to the extent that non-education partners a) enhance the project (e.g., add value) and b) are available to IHEs and LEAs*.

Perhaps most important of all, the RFP must maintain an internal consistency. Requirements for proposal narratives *must* reflect the criteria by which they are evaluated. Applicants should be required to format their proposal narratives in *exactly* the same order as the evaluation/selection criteria appear. Specifically, it is recommended that ABOR use the following categories for proposal narratives and for evaluating/selecting proposals:

- Demonstrated Need and the Improvement of the Quality of Teaching and Instruction
- Plan of Operation
- Evaluation Plan
- Underrepresented Student Access
- Budget and Cost-Effectiveness
- Commitment and Capacity Building *for Systemic Change*

Furthermore, within the section on "Demonstrated Need and the Improvement of the Quality of Teaching and Instruction," narratives should be required to explicitly address the six elements of program quality as endorsed by the U.S. Department of Education (cf. Table 3, p. 24; Appendix I). These six elements of quality should also be incorporated into a rating scale that will help evaluate this category of the proposal narrative.

In addition, within the section on "Evaluation Plan," proposals should include a *research component* that includes at least one of the following:

- outcome data on the effectiveness of the project in the school system (to be used by participants to enhance systemic change)
- a study of systemic change at the project site (for school-based projects)
- a contribution to the knowledge base on exemplary education practice

Evaluation requirements developed for local projects should be congruent with state-level evaluation design (see Recommendation #6).

ABOR also should adopt strategies to obtain greater involvement by IHE project personnel in disseminating information about project progress and accomplishments. To this end, the Board should strengthen RFP requirements for dissemination plans so that proposals explicitly address how project coordinators plan to disburse information about their programs. Options that should be enumerated in the RFP include the following:

- publication in an ABOR-sponsored IHE Eisenhower newsletter (cf. Recommendation #7.1)
- presentation at a state-level meeting
- publication of project results in a professional journal
- actual training at an LEA.

Finally, the RFP should include a checklist for proposal writers to ensure that their application is complete and addresses all aspects pertinent to the review process. This same checklist should be used by reviewers in critiquing RFPs and application packets for the purpose of awarding grants.

RECOMMENDATION #4: Revise the RFP, modeling it after other states' successful RFPs.

4.1 Clarify the distinction between cooperative programs and teacher preparation and enhancement programs.

4.2 Strengthen requirements for evidence of LEA involvement in cooperative planning, implementation, and evaluation.

4.3 Broaden the language soliciting proposals to emphasize *all* underrepresented and underserved groups.

4.4 Maintain emphasis on elementary and middle school groups.

4.5 Encourage non-education partnerships (e.g., business and industry) *to the extent that partnerships can enhance the project and to the extent that partners are available to IHEs and LEAs*.

4.6 Align the two sections of the RFP that deal with the "Format for Proposals" and "Evaluation/Selection Criteria."

4.7 Require that narratives and selection criteria explicitly address the six elements of program quality as defined by the U.S. Department of Education.

4.8 Develop specific requirements for local program evaluation that are congruent with state-level evaluation efforts.

4.9 Strengthen RFP requirements for project dissemination plans.

4.10 Create a checklist for the RFP and review process.

► **Review process**

As noted in Part II, IHE project proposers have expressed dissatisfaction with the proposal review process--a process they have perceived as frequently incoherent and sometimes biased. Revising this review process is essential.

The first thing that should be addressed is the composition of the review panel. It is suggested that the Board appoint panels of 8-10 individuals who represent a wide range of interest groups including, but not limited to: business and industry (e.g., ASPED members), community agencies, educational consultants (e.g., retired K-12 teachers and higher education professors), government agencies, institutions of higher education, K-12 teachers/administrators, and staff members of the Arizona Department of Education. Precedence for this type of panel exists in other states (cf. Appendix F), and it is the preferred option of Arizona stakeholders who provided input in this study.

Key Arizonans in math and science also recommend that panels be representative of underrepresented and underserved groups (e.g., ethnic minorities; females), and rural Arizona in order to ensure that educational equity issues are considered in the evaluation of proposals. Furthermore, at least one member of the panel should be knowledgeable about assessment and evaluation.

For the sake of both cost-efficiency and knowledge of Arizona issues, in-state panels are recommended but, as an option, out-of-state representation could be solicited through the Far West Regional Laboratory. In any event, *diverse representation must be maintained over time, but members of the review panel should be changed regularly.*

It is highly recommended that the Board adopt a policy that the Eisenhower program coordinator *not* serve as a proposal reviewer. Rather, the program coordinator should act as facilitator and technical advisor for the review panel, and program liaison for proposal writers and grantees. One of the roles of the IHE Eisenhower program coordinator should be to conduct a training session for proposal reviewers to explain such things as Arizona funding priorities, scoring criteria, and award preferences for certain types of proposals (e.g., those demonstrating high degrees of IHE and LEA collaboration). Policies related to the composition of the panel, as well as procedures used to determine grantees, should be clearly communicated to proposal writers (e.g., in the RFP, or in an informational packet, such as that suggested in Recommendation #3.1).

RECOMMENDATION #5: Revise the grant application review process.

5.1 Use 8-10 *in-state* proposal reviewers representing diverse interests in math and science.

5.2 Limit the authority of the ABOR Eisenhower program coordinator in determining grantees.

5.3 Provide training for reviewers prior to their involvement in critiquing proposals.

5.4 Disseminate information regarding the review panel and selection process to all potential grantees.

Improving State-Level Program Evaluation

In order to promote effective programs and practices, one must understand what such programs and practices are. Though the state has complied with federal requirements to collect student and teacher demographic data, other, more meaningful, information about the effectiveness of Eisenhower programs is lacking at both the K-12 and IHE levels. Documentation of such objective data is essential so that policy and decision-makers at all levels can determine the merits of continued funding. Both accountability and program improvement are at issue here.

Meaningful evaluation stimulates program improvement. It serves as a needs assessment by demonstrating what works and what doesn't. Evaluation results should be fed back into the system in order to target funding priorities, areas of the state, specific curriculum areas, teachers, students, and anything else that will improve Arizona's technological literacy.

Although the state-level evaluation of IHE Eisenhower programs is important, many details go beyond the scope of this study. Clearly, however, current data collection forms which require specific and redundant information regarding participant demographics should be discontinued. In their place, new forms should be developed that focus not only on teacher and student demographic characteristics but, more importantly, on program impacts regarding:

- teacher development
- student learning and/or academic learning behavior
- systemic change

For state-level evaluation, ABOR should work in concert with ADE to use state science and math achievement data (e.g., ASAP performance-based test results) to identify objectives for subsequent funding priorities. In short, evaluation should translate into program improvement.

RECOMMENDATION #6: Develop and implement a coherent strategy for state-level IHE program evaluation that is consistent with national and state goals for math and science.

6.1 Redesign data collection instruments/requirements for local programs to ensure the collection of meaningful information.

6.2 Periodically produce an evaluation report which summarizes programs and their respective results and accomplishments.

6.3 Disseminate the evaluation report.

Promoting "Effective" Programs and Practices

Much attention in this study has been devoted to determining what constitutes an "effective" program or practice. Many research-based practices are embodied in the six elements of program quality endorsed by the U.S. Department of Education (cf. Appendix I). Arizona practitioners tend to believe that these elements contribute to meaningful mathematics and science education and training programs.

Effective programs and practices are also perceived to be those that follow national curriculum frameworks and standards such as developed by the American Association for the Advancement of Science (AAAS) and the National Council of Teachers of Mathematics. Arizona's *Essential Skills* parallel national developments in this area.

The Arizona Board of Regents can actively promote effective programs and practices by following recommendations offered throughout Part III. For example, requirements for proposal narratives can emphasize how projects intend to address the six criteria of program quality, and the merit of proposals can be determined by how well such elements are addressed (Recommendation #4.7). Projects can be required to more strongly reflect school-based needs assessments and long-term goals which, in turn, must be linked with state *Essential Skills* (encompassed by Recommendation #4.2). Project evaluations can be required to focus more explicitly on evidence of program "effectiveness" (e.g., student/teacher outcomes).

Suggested changes in the way the IHE program is administered may also encourage the use of effective practices. For example, stronger program leadership, whereby program continuity is maintained over time (Recommendation #1), may promote program improvement by providing uninterrupted communication and program monitoring. Also, an improved state-level evaluation of IHE programs (Recommendation #6) should, in the long term, help identify those programs and practices that make a difference, and allow for targeted funding to support such strategies.

The Board should also consider ways to disseminate information about the effective programs and practices that *are* identified. Improving this area was judged by a panel of statewide experts to be essential for improving the state's IHE Eisenhower program. Regarding project-level strategies to improve dissemination, panel members recommended strengthening RFP requirements for project dissemination plans (cf. Recommendation #4.9). Regarding state-level strategies, the highest priority was given to developing a newsletter which would contain program information, results, grant announcements, and any relevant information pertaining to the IHE state Eisenhower program. Panel members also felt that state-level meetings provide a forum for disseminating project information.

RECOMMENDATION #7: Disseminate "what works" in mathematics and science education and training.

7.1 Develop a state IHE Eisenhower newsletter.

7.2 Provide/present Eisenhower program information at state-level meetings.

Providing Technical Assistance

Technical assistance is an integral component of a cohesive state-level Eisenhower program. Many other states provide their IHE Eisenhower grantees with support services to help them improve mathematics and science education and training (Appendix F). The need for similar support has been expressed by many involved with the state's IHE Eisenhower program.

In particular, some form of grant-writing assistance is considered essential by key members of Arizona's math-science community. At minimum, answers to the most commonly asked questions regarding preparation of an IHE grant proposal should be developed and distributed with RFPs. Other highly desirable technical assistance includes:

- a proposal writing workshop that could be conducted in person, via a teleconference, or videotaped and distributed upon request
- pre-proposal reviews by the ABOR Eisenhower program coordinator, or designated representative

Furthermore, as done for the first time during the most recent grant competition, the Board should continue to provide written feedback from reviewers to *all* proposal writers whether successful or unsuccessful.

Members of Arizona's math-science community felt the need for additional technical assistance in other areas such as program design, evaluation, and budgets. A preliminary recommendation called for the Board to serve as a broker or referral agent for such services. This recommendation was not finally adopted; instead, a suggestion was made for the Board to have consultants on retainer who a) do *not* have a vested interest in any specific Eisenhower proposal, and b) are available to advise any potential or actual grantee. It was further suggested that a list of available project consultants be developed and made available to proposal writers.

Given the limited financial resources allocated to the Board for the administration of the IHE Eisenhower program, and other needs considered more pressing by members of Arizona's math and science community, it may not be fiscally prudent to have consultants on retainer. It is, however, important that ABOR provide some grant-writing assistance and feedback.

RECOMMENDATION #8: Provide grant-writing assistance and feedback.

8.1 Develop answers to the most commonly asked questions regarding the grant application process and distribute this with the RFPs.

8.2 Conduct a proposal writing workshop either in person or via teleconference. Videotape the workshop, and make the tape available upon request.

8.3 Offer, as an option to proposal writers, a pre-proposal review by the ABOR Eisenhower program coordinator or a designated representative.

8.4 Provide written feedback from proposal reviewers to *all* proposal writers whether successful or unsuccessful.

Strengthening Interagency Linkages

In developing the *Arizona State Systemic Initiative Proposal*, dialogue began to address better linkages between a number of agencies and programs. The Arizona panel of experts felt that such linkages need to be nurtured. Although NSF funding would have provided direct impetus for greater interagency collaboration, a foundation has been laid. The panel, therefore, recommended that the intent of Arizona's proposed systemic initiative be preserved and at least parts of it implemented. In essence, it was suggested that ABOR serve as a catalyst for making many of the worthy goals reality.

Specific suggestions were offered as to how IHE Eisenhower funds could be coordinated with systemic initiatives should the state act to implement these reforms (cf. Appendix J, Recommendation #9). In addition, several recommendations made earlier in this section address interagency collaboration and underscore the notion of systemic reform. For example, one suggestion--to assign the daily administration of the IHE Eisenhower program to an ADE employee--would facilitate linkages between ABOR and ADE (Recommendation #1) and could serve to promote systemic reform. Recommendation #3 contains several specific suggestions for strengthening interagency linkages, not only between ABOR and the math-science community, but among LEAs, IHEs, and other potential partners in IHE programs.

Interagency linkages would also be reinforced by suggested modifications to the state's IHE Eisenhower RFP. These call for greater evidence of LEA involvement in program planning, encouragement for non-education partnerships, and changes in the writing and evaluation of proposals. Recommendations pertaining to proposal review panels would improve linkages by emphasizing a wide range of representation among panel members (Recommendation #5). Furthermore, closer coordination between ABOR and ADE is suggested for redesigning a state-level evaluation of IHE Eisenhower programs (Recommendation #6).

In addition to the issues addressed by the above recommendations, there appears to be an overarching need to preserve dialogue among members of Arizona's math-science community. Several mechanisms for preserving this dialogue were discussed. They include better use of communication systems (e.g., E-mail, public television, teleconferencing), and establishment of an "educational summit" for the purpose of conceiving and developing action steps for implementing an "Arizona Systemic Initiative"[4]. Among those invited to the summit would be members of the Arizona Board of Regents, Arizona Department of Education, Governor's Office, business organizations, educational associations, and others.

[4] The panel suggested that the original state systemic initiative be renamed the Arizona Systemic Initiative, and that the state take steps to ensure that the initiative is implemented, even without NSF funding.

Given that continued dialogue is essential for a more cohesive and conscientious deployment of IHE Eisenhower monies, the Board should consider actions to promote such dialogue.

RECOMMENDATION #9: **Work in coordination with the Arizona Department of Education to establish a permanent steering committee to jointly plan for the use of *all* state Eisenhower monies (i.e., K-12 and IHE), in concert with other reform efforts.**

SUMMARY OF RECOMMENDATIONS

This study has examined Arizona's higher education Eisenhower program with a goal of developing strategies that will assist the Arizona Board of Regents in deploying the state's limited resources more effectively. Arizona's IHE program can benefit substantially if the Board strengthens program leadership, redefines the process for distributing funds, designs a coherent state-level evaluation program, institutes support services for IHE Eisenhower grantees, and forges stronger interagency linkages to ensure program coordination with K-12 and other significant state-level reform efforts. To these ends, this report offers the following specific recommendations.

RECOMMENDATION #1: **Assign the day-to-day duties of administering the IHE Eisenhower program (for one-quarter time) to a permanent, full-time state employee with expertise in mathematics and science training and educational issues and programs.**

RECOMMENDATION #2: **Work in coordination with the Arizona Department of Education to revise and institutionalize an annual funding cycle congruent with LEA Eisenhower funding cycles.**

2.1 Establish 18 month project cycles, with project options for 1) renewal and 2) no-cost extensions.

2.2 Maintain project budgets at *a maximum* of $50,000 per year ($75,000 for 18 months; $150,000 for three years).

RECOMMENDATION #3: **Broaden the distribution of IHE program information and RFPs.**

3.1 Develop informational materials (e.g., a promotional brochure or pamphlet) that describe the intent and nature of the state's IHE Eisenhower program, including the specifics of when RFPs/grants are available and from whom RFPs are available.

3.2 Distribute information about the IHE program to all state LEAs, museums, zoos, and other agencies representing potential partners in an IHE program.

3.3 Request each eligible IHE in the state (i.e., community colleges and universities; public and private) to develop a list of "key" liaisons/contacts to whom non-IHE personnel may be referred.

3.4 Distribute RFPs to each member of an IHE's newly-established list of liaisons/contacts, and to each IHE's grant office, chief academic officer, and other personnel currently on ABOR's mailing list.

RECOMMENDATION #4: Revise the RFP, modeling it after other states' successful RFPs.

4.1 Clarify the distinction between cooperative programs and teacher preparation and enhancement programs.

4.2 Strengthen requirements for evidence of LEA involvement in cooperative planning, implementation and evaluation.

4.3 Broaden the language soliciting proposals to emphasize *all* underrepresented and underserved groups.

4.4 Maintain emphasis on elementary and middle school groups.

4.5 Encourage non-education partnerships (e.g., business and industry) *to the extent that partnerships can enhance the project and to the extent that partners are available to IHEs and LEAs.*

4.6 Align the two sections of the RFP that deal with the "Format for Proposals" and "Evaluation/Selection Criteria."

4.7 Require that narratives and selection criteria explicitly address the six elements of program quality as defined by the U.S. Department of Education.

4.8 Develop specific requirements for local program evaluation that are congruent with state-level evaluation efforts.

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4.10 Create a checklist for the RFP and review process.

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5.3 Provide training for reviewers prior to their involvement in critiquing proposals.

5.4 Disseminate information regarding the review panel and selection process to all potential grantees.

RECOMMENDATION #6: **Develop and implement a coherent strategy for state-level IHE program evaluation that is consistent with national and state goals for math and science.**

6.1 Redesign data collection instruments/requirements for local programs to ensure the collection of meaningful information.

6.2 Periodically produce an evaluation report which summarizes programs and their respective results and accomplishments.

6.3 Disseminate the evaluation report.

RECOMMENDATION #7: **Disseminate "what works" in mathematics and science education and training.**

7.1 Develop a state IHE Eisenhower newsletter.

7.2 Provide/present Eisenhower program information at state-level meetings.

RECOMMENDATION #8: **Provide grant-writing assistance and feedback.**

8.1 Develop answers to the most commonly asked questions regarding the grant application process and distribute this with the RFPs.

8.2 Conduct a proposal writing workshop either in person or via teleconference. Videotape the workshop, and make the tape available upon request.

8.3 Offer, as an option to proposal writers, a pre-proposal review by the ABOR Eisenhower program coordinator or a designated representative.

8.4 Provide written feedback from proposal reviewers to *all* proposal writers whether successful or unsuccessful.

RECOMMENDATION #9: **Work in coordination with the Arizona Department of Education to establish a permanent steering committee to jointly plan for the use of *all* state Eisenhower monies (i.e., K-12 and IHE), in concert with other reform efforts.**

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APPENDICES

Appendix A: Interviewees for Eisenhower Project

Appendix B: Factors Affecting the Future of Arizona's IHE Eisenhower Program

Appendix C: Interview Questions and Responses

Appendix D: K-12 Teacher-Trainee Survey Responses

Appendix E: Commentary by External Proposal Reviewers

Appendix F: Administering IHE Eisenhower Programs--Perspectives from Other States

Appendix G: Side-by-Side Analysis of Arizona IHE Eisenhower RFPs

Appendix H: Arizona IHE Eisenhower Programs (1990-1993)

Appendix I: Federal Regulations Governing IHE Eisenhower Programs (Selected Excerpts)

Appendix J: Preliminary Recommendations

APPENDIX A

Interviewees for Eisenhower Project

Name	Selected because of role(s) in...			Representing
	SSI[1]	IHE[2]	Other	
Ms. Heather Alberts		FY '91 (II) Staff		Women in Science & Engineering Program, University of Arizona
Ms. Junardi Armstrong		FY '91 (II) Staff		Center for Insect Science, University of Arizona; Obtained input from approximately 15 teachers in her program
Ms. Nancy Ballinger			SSI Liaison	Program Manager/Education Partnerships, Intel
Ms. Myra Bertilson			State Agency	Administrative Assistant, ABOR
Ms. Mary Della Bourgeois	X			Community Liaison, Science-Technology in Society Project, College of Education, Arizona State University
Dr. Joaquin Bustoz		FY '91 (I) PD		Department of Mathematics, Arizona State University
Dr. Marta Civil		FY '91 (I) PD		Department of Mathematics, University of Arizona
Ms. Barbara Clark			SSI Liaison	Manager, Arizona External Education Systems, Motorola
Dr. William Cobern		FY '91 (II) PD	Past IHE grantee	Education Unit Arizona State University-West
Mr. Richard Condit			State Agency	State Director of Vocational-Technological Education, ADE
Dr. Diane Ebert-May		FY '90 FY '91 (I/II) Staff		Director, Science and Mathematics Learning Center, Northern Arizona University
Dr. Odus Elliott			State Agency	* Former ABOR IHE Eisenhower Program Administrator
Dr. Jon Engelhardt	X			Executive Director, Center for Excellence in Education, Northern Arizona University

[1] Member, State Systemic Initiative Steering Committee

[2] Higher Education Eisenhower Project Involvement: FY = Fiscal Year; I = Phase I funding; II = Phase II funding; PD = Project Director; Staff = Project Staff

Name	Selected because of role(s) in...			Representing
	SSI	IHE	Other	
Dr. Betz Frederick	X			Mathematics Education, Grand Canyon University
Dr. David Gay	X	FY '91 (I) Staff		Department of Mathematics, University of Arizona
Dr. Richard Greenberg		FY '90 PD		Chair, Intercollege Science Education Committee, University of Arizona
Dr. Willis Horak	X		Past IHE grantee	College of Education, University of Arizona
Dr. Charles Hoyt	X			AZ Alliance for Mathematics, Science, and Technology Education
Ms. Linda Jaslow	X			State Mathematics Supervisor, ADE
Dr. Edward Johnson	X		State Agency	Interim Associate Director for Academic Programs, Arizona Board of Regents
Ms. Elizabeth Karabatsos			ASPED/ GSPED; SSI Liaison	Ombudsman, McDonnell Douglas; Governor's Science and Technology Advisory Council
Dr. Gary Keller		FY '91 (I) PD		Hispanic Research Center, Arizona State University
Dr. Phillip Keller			Past IHE proposal reviewer	Faculty, Chemistry, University of Arizona
Dr. Paul Koehler			State Agency	Associate Superintendent, ADE
Mr. Michael Lang	X		State Agency	State Science Supervisor, ADE
Dr. Larry Labofsky		FY '91 (II) PD		Lunar and Planetary Laboratory, University of Arizona
Ms. Martha Labofsky		FY '91 (II) Staff		Lunar and Planetary Laboratory, University of Arizona
Dr. Jane-Jane Lo	X			Education Unit, Arizona State University-West
Ms. Joan McCarter		FY '90 PD		Department of Mathematics, Arizona State University
Dr. Ed McCollough	X		ASPED	Dean, College of Sciences, University of Arizona
Mr. Steve Merrill	X			K-12 Eisenhower Program Coordinator, ADE
Mr. John Mildrew		FY '91 (II) PD		South Mountain Community College

Name	Selected because of role(s) in...			Representing
	SSI	IHE	Other	
Ms. Saundra Minckley		FY '91 (II) PD		Mesa Community College
Dr. Martha Narro		FY '90 PD FY '91 (II) PD		Department of Biochemistry, University of Arizona
Dr. Kathleen Parkhurst	X			Superintendent, Oracle School District #2 (K-8); President, Rural Schools Association
Dr. Ernesto Ramirez	X			Director, Comprehensive Regional Center for Minorities, MCCCD
Ms. Nora Ramirez		FY '91 (II) Staff		South Mountain Community College
Mr. Dave Rappuhn			Business/ Industry	Manager of Human Resources Training, McDonnell Douglas
Dr. Sheryl Santos		FY '90 PD		College of Education, Arizona State University
Dr. Fred Staley	X			Director, Science-Technology in Society Project College of Education, Arizona State University
Ms. Brownie Sternberg	X		Past IHE LEA	Director, Project SMART, Mammoth-San Manuel Unified School District
Mr. Robert Swift		FY '90 FY '91 (I) PD		Science and Mathematics Learning Center, Northern Arizona University
Dr. Jay Tashiro	X			Science and Mathematics Learning Center, Northern Arizona University
Mr. Michael Trimble	X			President, AZ Science Teachers Association
Dr. Joanne Troutman		FY '91 (II) Staff		Women in Science and Engineering Program, University of Arizona
Dr. Steve Willoughby			Past IHE proposal reviewer	University of Arizona
Mr. Hal Wochholz			Business/ Industry	Engineer/Staff Assistant in Engineering McDonnell Douglas
Mr. Steve Zylstra			Business/ Industry; ASPED	President/CEO General Pneumatics Corps.

APPENDIX B

Factors Affecting the Future of Arizona's IHE Eisenhower Program

In fall 1992, Arizona's educational system was in a state of flux. At both the state and local levels, people were discussing or implementing major reforms prompted by the state legislature, the Arizona Department of Education, the Governor's Task Force on Educational Reform, business and industry representatives, and local school boards. Proposed or actual reforms involved decentralization, open enrollment/parental choice, restructuring, site-based management, teacher training and professionalism, school accountability, and education finance (Office of the Governor, 1991; cf. Sheane & Bierlein, 1991, 1992).

These reforms created a context of change for Institute analysts, who were charged with developing a strategic plan for more effective deployment of higher education Eisenhower funds in Arizona. As initially brought to light in fall 1992, two significant events contributed to this context. First, the state had recently submitted a state systemic initiative (SSI) proposal with implications for the use of higher education Eisenhower monies. Second, the Dwight D. Eisenhower Mathematics and Science Education Act was scheduled for congressional reauthorization in 1993.

As of the writing of this report in late May 1993, the final outcome of the reauthorization of the Eisenhower Act was undecided, but Arizona's Eisenhower liaison in Washington indicated that the most likely scenario would be a *one-year* reauthorization of the Eisenhower funding as it currently exists. The status of the SSI became known in mid-May, and was *not* accepted for funding.

Because of the importance of each of these events in shaping the course of this study, each is summarized briefly in this appendix.

► An Overview of the *Arizona State Systemic Initiative Proposal* and Its Implications for IHE Eisenhower Programs[1]

This section provides a cursory overview of key elements of the *Arizona State Systemic Initiative Proposal*, and implications for IHE Eisenhower programs. The proposal was submitted by the Arizona Department of Education (ADE) to the National Science Foundation in the fall of 1992. The proposal specified plans to reform mathematics and science education in the state over a five-year period at a cost of $10 million ($5 million in new NSF funds). Building upon existing curriculum frameworks (i.e., Arizona *Essential Skills*) and their accompanying performance-based assessment system (i.e., the Arizona Student Assessment Program, or ASAP), the proposal focused on three key elements of "Restructuring Arizona Mathematics and Science." These were: (1) "expanded professional development opportunities to support practicing teachers and provide in-service programs focused on training teachers to teach successfully the outcomes specified in the *Essential Skills* frameworks"; (2) "changes in preservice education to ensure that all new teachers entering Arizona classrooms have adequate mathematics and/or science content background and teacher education (subject specific pedagogical skills) to implement the framework vision"; and, (3) "the galvanizing of public support and involvement" (pp. i-ii).

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[1] This summary includes excerpts from the *Arizona State Systemic Initiative Proposal* prepared by the Arizona Department of Education (1992). Throughout this summary, underlining has been used to highlight references to IHE Eisenhower monies/programs.

Enhancing professional development

According to Arizona's systemic reform plan, summer academies and teacher training centers were to be the vehicles for enhancing professional development. According to the proposal: "Academies will focus on organizational-level change and work with teams; centers will focus on what happens in the classroom and work primarily with teachers, especially mentor and lead teachers" (p. 18). "Local systemic plans" were to be required for an LEA to participate in an SSI program. Local systemic plans were intended to drive the kinds of training that academies and centers offer, such that all training would be customized to meet locally-defined needs. Plans were to specify "how the *Essential Skills* framework will be implemented and district assessment plans developed" (p. 16).

While academies were to be coordinated through ADE, centers would have been funded by SSI monies via a competitive process that required certification by the Arizona Department of Education and an SSI Governing Board. It was proposed that one of the provisions to qualify for certification be that "at least 40 percent of the program budget should be from in-kind, higher education Eisenhower grants, local school Eisenhower funds, or private funds" (p. 21).

Revamping preservice

Supported by higher education Eisenhower funds, the Arizona SSI envisioned offering universities with "financial incentives to develop 'break the mold' models of teacher preparation" that would not only upgrade teachers' mathematics and/or science content knowledge and pedagogical skills, but also prepare teachers to implement the state's curriculum frameworks (p. 24). Arizona's plan called for $2 million over the five-year period to be allocated to preservice education (or 20 percent of the total NSF grant). According to the proposal, "We expect that these monies will be leveraged with Institution of Higher Education (IHE) Eisenhower dollars and/or other funds to multiply the impact of these grants" (p. 26).

Galvanizing public support and involvement

The final component of Arizona's SSI specified greater efforts to involve business/industry and the public in "[working] together toward changing mathematics and science education" (p. 26). Plans were to catalogue and study existing business/industry partnerships for the purpose of disseminating model programs and processes, while soliciting new kinds of partnerships. Public outreach plans included working with media to implement a "broad public relations campaign," and developing a speakers bureau (pp. 28-29).

Regarding the integration of Eisenhower Funds with SSI programs, the proposal suggested the following:

> "For Arizona's SSI to succeed, schools and school districts will need to coordinate the development of their systemic plans with the application and funding cycles of the local Eisenhower program. Equally important, the review of training center plans must be coordinated with the application and funding cycles of the higher education Eisenhower program. As for state Eisenhower funds, we will use these to conduct leadership training for academy and training center faculty. ...In this way we will articulate systemic plans, training center plans, and leadership training with Eisenhower programs. This will allow us to integrate local, state, and higher education Eisenhower funds with the resources of NSF, business, and industry" (p. 30).

▶ An Overview of CCSSO Recommendations on the Reauthorization of the Hawkins/Stafford Amendments of 1988[2]

This section provides a cursory overview of key recommendations affecting the reauthorization of the Eisenhower Act as it operates within Title II of the Elementary and Secondary Education Act (ESEA), as amended by the Hawkins/Stafford Amendments of 1988. Briefly, the Chief Council of State School Officers (CCSSO) unanimously approved recommendations that they believe preserve the purposes of the Hawkins/Stafford Amendments while restructuring programs "to gain greater aggregate high performance student results and to assure all eligible populations are served" (CCSSO, 1992a, p. ii).

Referred to as the *High Performance Learning Act*, CCSSO recommendations represent only one set of recommendations potentially affecting educational legislation. However, CCSSO is considered one of the more powerful "lobbying" groups and has a track record of affecting change at the federal level. Sources in Washington indicate that even if CCSSO-proposed changes are *not* implemented by the 103rd Congress, there is a likelihood that recommendations will be acted upon in the future. According to the CCSSO's proposed *High Performance Learning Act*:

> "The Council recommendations are designed around the concept of 'federal program clustering with state and local options to consolidate.' The concept maintains the 'categorical' characteristics of key federal programs such as targeting identified population groups and to particular use of funds. Separate line item appropriations would be continued for each of the categorical programs, thereby enabling the Administration and Congress to make determinations on budget priorities and adjust appropriations to changing conditions. By clustering programs which have similar characteristics under the several titles of a new bill, the legislation enables state and localities at their option to consolidate federal programs in ways which most effectively serve the intended populations and uses" (1992a, p. ii).

The Eisenhower Math and Science program is currently funded under Title II along with programs such as Chapter 2 state and local programs, Magnet Schools Assistance, FIRST, Foreign Languages, and Gifted and Talented programs. Recommendations affecting these programs focus on "legislatively supporting systemic change." Following the CCSSO proposal:

> "Federal and state oversight would shift from 'accounting' (for dollars) to 'accountability' (for student success), from creating a paper trail for specific federal inputs to measuring overall improvements in student outcomes. ...Federal funds under Title 2 would be focused on high performance learning for identified populations.... The criteria for grant approval, therefore, would encourage a shift from identifying specific uses of federal dollars for staff, equipment, etc., to the integration of those dollars into the 'whole school' program for raising the level of student performance" (1992a, p. 20).

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[2] This summary includes excerpts from *High Performance Learning Act: Recommendations on the Reauthorization of the Hawkins/Stafford Amendments of 1988* and *High Performance Learning Act: Side-by-side of CCSSO Recommendations and Current Law* both prepared by the Council of Chief State School Officers (CCSSO, 1992) and presented to the 103rd Congress. Readers are encouraged to obtain these documents from CCSSO for further information.

With this brief overview in mind, Table B-1 on the following page presents CCSSO recommendations that specifically affect the use of state Eisenhower monies. These recommendations are taken directly from the CCSSO document *High Performance Learning Act: Side-by-side of CCSSO Recommendations and Current Law* (1992b, pp. 38-39).

CCSSO recommendations designed around the concept of "federal program clustering with state and local options to consolidate" have important implications for the future of the Eisenhower program. One scenario is that states will have the option of waiving their use of the higher education set-aside funds in favor of using these funds to support state agency (i.e., ADE) comprehensive systemic change plans. In other words, the entire 25 percent of Eisenhower state funds currently administered by the Arizona Board of Regents *could* be used by the Arizona Department of Education for training and retraining efforts, assuming mutual acceptance of this arrangement by ABOR and ADE.

In the event that states could request a waiver (i.e., should an option be placed into statute), there might be a funding stream for state Eisenhower monies as depicted in Figure B-1 (in contrast to the current scheme as shown in Figure 2 of the report, p. 14). Of course, this would depend upon the mutual agreeability of such an arrangement by the state education agency (ADE) and state education agency for higher education (ABOR). Because this is a proposed option, and few details are known, discussing it as a *real* possibility is premature at this point in time.

Figure B-1. New *Possible* State Allocation of Eisenhower Funds

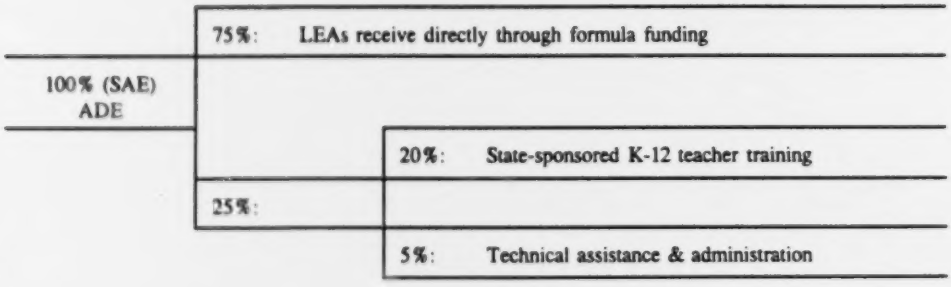


Table B-1: CCSSO Hawkins-Stafford Recommendations Side-by-Side

EISENHOWER MATH/SCIENCE

Existing Law	Recommended Change	Rationale
	Allocations	
Section 2006(c) states that not less than 5% of the Eisenhower funds available for elementary and secondary programs shall be used by the SEA for demonstration and exemplary programs in math and science education. Section 2006(e) authorizes SEAs to use not more than 5% of the Eisenhower funds (or $20,000 if it's a larger amount) available for Elementary and Secondary Education to provide technical assistance to LEAs, IHEs, and nonprofit organizations, and for the costs of administration and assessment of programs assisted under this part.	Revise the distribution of funds to allow at least 25% of the state grant to go to state-level demonstration and exemplary programs, dissemination of successful programs, and technical assistance, with a 5% cap on administration, monitoring, and evaluation.	A larger state-level set-aside is needed as a vehicle for comprehensive statewide reform of curriculum and teacher training, as well as LEA involvement in state initiatives.
	Teacher Training	
Section 2005(b) provides that for each fiscal year, 25% of each State's allotment for the Eisenhower programs shall be used for higher education programs.	Planning for use of the higher education set-aside under the Eisenhower Math and Science program would be joint between the state agencies (if more than one) primarily responsible for elementary and secondary, and higher education.	Collaboration between elementary and secondary and higher education is essential for maximum effectiveness within the state.
No Comparable Provisions	Allow 20% for cooperative projects on a non-competitive basis. Entities eligible as fiscal agents for grants should be broadened to include museums, science and technology centers, zoos, and other agencies that provide professional development support to educators.	These entities provide valuable professional development.
No Comparable Provisions	Focus in-service training activities on <u>all</u> appropriate teachers in a particular school or district.	Interpretation of current law is too narrow and often leads to limits on the use of funds for teachers in the subject areas of math and science.

APPENDIX C

Interview Questions and Responses

Between October 1992 and January 1993, Morrison Institute analysts interviewed 48 key stakeholders invested in improving "the state of mathematics and science education" in Arizona. These stakeholders included people throughout the state representing K-12 education; postsecondary departments of education, mathematics, and science; business and industry; state government agencies; and Arizona mathematics and science organizations (see Appendix A).

In selecting interviewees, the intent was to elicit opinions from a diverse group of math and science faculty, teacher trainers and the recipients of training, business and industry representatives, and members of state agencies. Target groups included members of Arizona's State Systemic Initiative (SSI) Steering Committee, and past and present IHE Eisenhower grant recipients and their training recipients. In particular, feedback was elicited from IHE Eisenhower grant recipients not only regarding the elements of their training and retraining efforts that have been successful or proven problematic, but also regarding the Arizona Eisenhower request for proposals process and evaluation requirements.

With respect to members of the SSI Steering Committee, a sample of the committee was selected to represent organization leaders, postsecondary representatives (university and community college personnel), and business and industry representatives. The intent was to have representation from active and informed participants in math-science reform efforts, rather than to have a "statistically representative" sample of respondents from each category. In addition, deans of the colleges of education from Arizona State University, University of Arizona, and Northern Arizona University were contacted, as was the "unit director" for Education at ASU-West and a representative from Grand Canyon University. All interviews were strictly voluntary; where primary contacts declined interviews, they referred researchers to other people in their agency or organization.

Formal interviews were conducted using the questions depicted in Table C-1. A majority of the interviews were audio-taped and transcribed. Several respondents provided written answers to the interview questions; notes were taken for informal interviews. Interview notes, transcripts, and written responses were analyzed qualitatively. The results of this analysis comprise the remainder of this appendix.

Table C-1: Interview Questions

I. THE STATE OF MATH-SCIENCE EDUCATION: What, in your view, does "strengthening math-science education" mean? (What needs to be strengthened?) Generally, what are the issues or barriers existing today that prevent stronger math-science programs? What changes in the "system," if any, are needed for improving math-science education? If you had to assign priorities to necessary reforms, what would your priorities be?

II. IHE PROGRAMS: What elements make a successful math-science inservice program?

- **Delivery systems/partnerships**: *IHE requires a "partnership" with one or more LEAs and encourages partnerships with business/industry.* -- What constitutes a "successful partnership"? What is the IHE role in a partnership? What is the role of the LEA in a partnership? Where does business/industry "fit in?" What kinds of interagency partnerships are most beneficial to a program?

- **Content/curriculum taught**: *A diverse number of projects are funded focusing on different kinds of subject matter...seeming to provide "one-shot" opportunities for inservice training.* -- How could the Eisenhower IHE programs be strengthened in terms of what is taught? (What should be the emphasis, if any, on the subject matter of the inservice?)

- **Selection criteria for participants**: *There exists an emphasis on the recruitment of minorities and other underrepresented populations (OUP).* -- What techniques have you used to successfully recruit minorities/OUP? What barriers to minority access and achievement remain? How could minority participation be strengthened? What policies are necessary to overcome barriers?

- **"Quality" criteria:** *Recent federal changes in the Eisenhower program request evidence of a program's "quality," defined according to six criteria.* -- How does your program address the following: 1) The program's relation to long-term improvement goals; 2) The program's ability to allow for integration into understanding and implementation; 3) The program's relation to classroom assignments; 4) Whether or not the program includes professional teams (rather than individuals) that can work with each other over time; 5) Whether or not the program provides follow-up activities or reinforcement activities or both; and 6) The administrative and policy support of the school of LEA? What criteria do <u>you</u> feel define a "quality" program?

- **Evaluation methods**: *As in all RFPs, there is an evaluation requirement. Two issues: 1) Local programs vary with respect to the strength of their local evaluations; 2) There does not appear to be any systematic effort to analyze or report the results of individual program evaluations at the state level.* -- For **local** programs: What should be the criteria for assessing program success? At the **local/state** level: Given that increased accountability is here to stay, what can/should be done to strengthen evaluation?

- **Dissemination activities**: *There is increased interest in improving the dissemination of information about "what works" throughout the state.* -- How do you disseminate information about your program? What kinds of dissemination activities are most beneficial to you? What could be done to improve the dissemination of information?

III. ROLE OF ABOR/POLICIES: What could the board do to improve its own policies and procedures relative to Eisenhower projects? (e.g., grant time frames; selection/evaluation criteria; awards/$$) What policy changes, at the program or state level, could potentially strengthen your program?

IV. THE STATE SYSTEMIC INITIATIVE: Are you aware of the proposed State Systemic Initiative and, if so, how do you see IHE Eisenhower grants as being able to strengthen math-science education in grades K-12 within this framework?

I. THE STATE OF MATH-SCIENCE EDUCATION

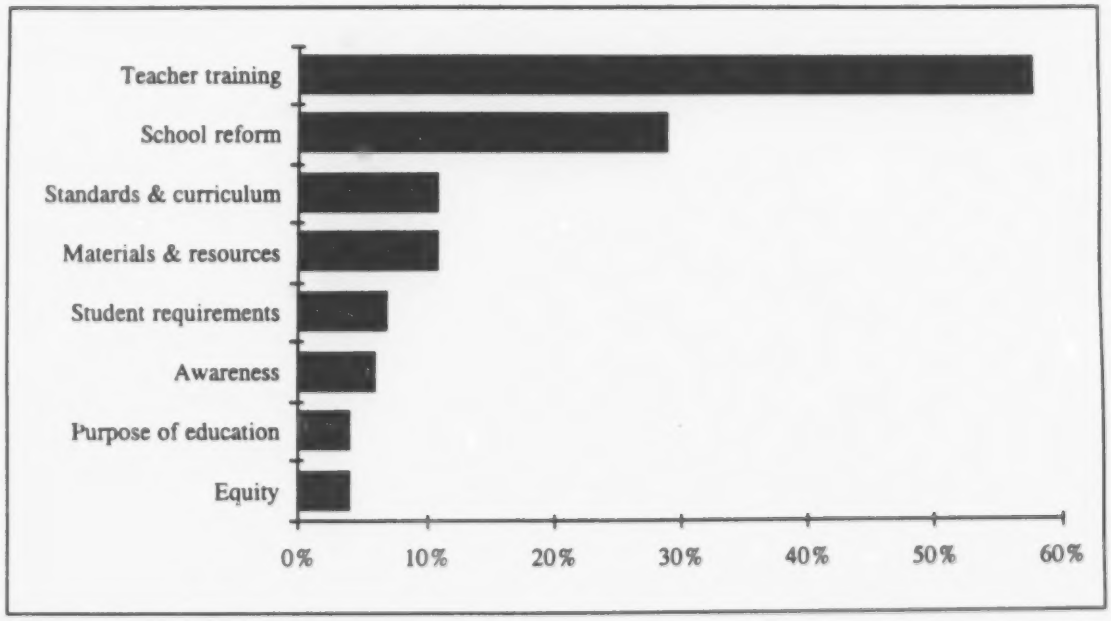
Once acquainted with the purpose of Morrison Institute's research on behalf of the Arizona Board of Regents, interviewees were asked questions about strengthening math-science education in Arizona. The discussion that follows is by no means as rich in detail as were the interviews themselves. Rather, the intent is to synthesize the broader themes that emerged from an analysis of interview responses.

Wide-ranging responses were obtained in answer to questions related to strengthening mathematics and science education. Furthermore, as anticipated, there was considerable overlap in response to questions insofar as areas targeted for strengthening were also those in which change was perceived as necessary. In Part I of this appendix, interviewees' opinions on "what needs to be strengthened" have been summarized in their order of priority. This will be followed by a section that addresses issues and barriers that are believed to be preventing meaningful reform.

▶ Priorities for strengthening mathematics and science education in Arizona

Some of the 48 people interviewed addressed priorities, while others addressed more than one area in need of reform. Responses were analyzed up to a person's third stated priority. Figure C-1 shows the *percentage of total respondents* who identified a particular topic as a priority for reform. Items were included if more than one respondent mentioned the topic. Category labels were assigned by researchers with the understanding that such broad categories encompassed a number of specific topics, each with its own nuance.

Figure C-1. Priorities for Strengthening Math and Science Education in Arizona (N = 48)



Teacher training

Through analyzing interview notes and transcripts, it soon became clear that there are multiple concerns and priorities in Arizona with respect to math and science reform, and that consensus is difficult to obtain except at the most global level. Nevertheless, as Figure C-1 shows, 67 percent of the Arizonan's interviewed see teacher training as the key element for reform:

> "I can't help but think that the key to it all is the science and math education that teachers are getting at the university. Mostly I'm not talking about pedagogical, but science, content. Most of what's happening in math and science education...does not have to do with understanding the discipline. It has to do with learning facts. Its just like the history class--memorizing facts. And that isn't the way you teach science. You don't get an understanding of math or science that way. And that's what we're doing at the undergraduate level."

> "From my perspective, [what needs to be strengthened is] the training that teachers have ...so that the training involves hands-on practical applications of scientific and mathematical concepts....I think that there are probably many math and science teachers, particularly in the lower grades, that do not have the conceptual background. They are certainly good--as the ASAP test has shown--at computational mathematical concepts, but not at application or problem-solving techniques, or translating that computational information to real life situations and doing learning exercises that help students make those connections. From my experience, we have some excellent teachers who can teach content, but can't teach that translation--*do* that translation."

> "The first major thing that needs to be strengthened, and they seem to be the dinosaurs in this chain, are the universities. Universities are the slowest to change in the whole science education reform movement--the reward structure for promotion and tenure in universities does not provide faculty who may be interested in teaching and learning in their discipline the opportunity to pursue some of those questions."

> "Some of the worst science teaching takes place *not* at the K-12 level, but at the university level....I work primarily with people who are going to be elementary teachers, and they don't like science at all. And, they'll give you very clear reasons as to why they don't like it, and it oftentimes has to do with their exposure to science at the college and university. So I think that's [an] important issue: What can we do about university-level science teaching so that these people who are going to teach at the elementary level don't come away with such a poor, poor opinion of what science is about?"

Most respondents discussed teacher training as inclusive of both preservice and in-service; some ranked these separately. Of those who separated the two, more felt that in-service--or "professional development" and "teacher enhancement"--deserved a higher priority than preservice because it is "more urgent." Regardless of whether talking about training new teachers or practicing teachers, better teacher training programs rely in large part on the university system which is perceived as in need of improvement in areas such as:

- libraries which have the materials to address research on teaching and include media arts and computer programs
- better articulation with the K-12 and community college system, and the community
- better cooperation and collaboration between departments at the same university and between universities
- better training programs designed especially for elementary teachers
- math and science faculty who are "sensitive" to the needs of practicing K-12 teachers (e.g., addressing pedagogical issues in conjunction with content)

Better teacher training programs, both preservice and in-service, seem to be viewed as the panacea for improving our educational system. Yet while people agree that teacher education in math and science is a priority, the emphasis of the training is subject to some debate. The following quotations illustrate the diversity of opinion on what needs to be strengthened in teacher training programs.

> **What is taught (i.e., content)**: "The fields change very rapidly....[Teachers] can be very out-of-date if there is not a way for them to access current information."
>
> **Methodologies used in the classroom**: "There needs to be utilization of instructional strategies which are [currently] skirted around because the teachers do not really know how to implement them."
>
> **The backgrounds and attitudes of teachers**: "To me one of the biggest problems, at least at the elementary and middle school level, is in the backgrounds of the teachers....Not that they're incapable of learning but...for most elementary school teachers, math and science were their worst courses in college. They *had* to take it; they really didn't want to take it; they did it anyway. So now this feeling gets put across to kids."
>
> "We operate on the assumption that those [students who learn through an abstract auditory system] are the intelligent learners when, in fact, that is just a style of learning. So I consider that mind-set in education a real barrier."
>
> **Reaching all students**: "At least in the elementary schools, there really is no equality in the amount or type of material presented....Some of our kids are obviously getting more in the way of math and science. Some teachers will not do hands-on experiments. They don't have the time; they don't have an aide; or they don't feel confident in the results--and other teachers thrive on it. So even though they are within the same grade, within the same school, within the same district, there is certainly a totally different experience for the child depending upon the teacher."

School reform

Forty-one percent of the interviewees focused on the need for some kind of school reform which, in this context, refers to a change in the existing school environment. Some respondents focused on details of the school environment such as class size, student-teacher ratios, and class scheduling (e.g., 50-minute class periods) that were felt to interfere with a teacher's ability to engage in more hands-on experimentation. Others focused on a need to examine the larger "system:"

> "[We can't talk about changes] without talking about revamping everything in how schools are done--how public schools work....Teachers don't get support, in many instances, from the administration....Everything in the school system should be working to support the teacher in the classroom."
>
> "Our [program] focus was probably 90% on teacher enhancement, and that's how we viewed ourselves, as dealing with curriculum/instruction and that would be pretty much it.... A few months into it, we discovered that we were just going to be one more added piece--of the 99 they already had, we were just going to be number 100 that they're trying to deal with. So we said, what's really needed to make a change here, to make something significant happen, to pull these pieces together, we need to be focusing on restructuring--not just of the school, but of the school *community*, because the school is the focus of the community."
>
> "We have these frameworks [like] the *Arizona Science Essential skills*, Arizona Environmental Education Act, etcetera. The key is going to be...if, in fact, communities of learners, communities of scholars--that is, the learning community--can fuel curriculum instruction to meet these frameworks while addressing the nuances of those communities....That, in my opinion, is school reform....If the issues...of the school communities can be designed in a way to fit into national frameworks, yet remain autonomous for the community, then we'll have success in the long term."

Respondents alluded to the need for "infrastructure support" for teachers, changes in administration and the attitudes of administrators, a need for "teacher empowerment" and "teacher enhancement," and the need to "untangle bureaucracy."

Standards and curriculum

As Figure C-1 illustrates, more than one-quarter (28 percent) of the interview sample focused specifically on the need to change the curriculum or content of what is taught. They want this addressed in preservice/in-service, although primary focus was on getting these changes into the K-12 classroom. Several respondents noted the rapid changes in content--particularly in science--and the difficulty of teachers keeping pace with recent changes in the field. Two people specifically mentioned a need to develop curriculum "standards" in science similar to those available in mathematics (as developed by the National Council of Teachers of Mathematics), and cited the work of the American Association for the Advancement of Science in this area (cf. West, 1992).

Materials & resources

Eleven respondents (24 percent of the interview sample) felt that a priority for strengthening math and science education was ensuring that teachers had adequate materials and resources, including monetary support for programs.

Strengthening student requirements

Collectively, respondents addressed student preparation at all levels of the educational system, as the following statements illustrate:

At the elementary level: "To strengthen mathematics...involves preparing kids to live in the time that they are going to live, rather than the time we have lived or when our grandparents lived. What this means is that they have to learn to *use* mathematics to adapt to new situations, to use technology effectively and, at the same time, not to misuse technology."

"A big thing for me is to get kids to think about what they are doing and to solve problems; to solve problems that involve a lot of different steps, exploration, guessing, playing around, and problems that are more like real-world problems....That means that you also want to make connections between mathematics and the real world...[to get students] to see that math is a set of tools and thinking processes...to solve problems."

At the high school level: "One key thing is that we don't give [students] enough [math and science instruction]...and they need it more than ever. They only have to take two years of math and two years of science. That two years of math can be arithmetic and consumer math, and that's it! In *high* school!...So I sit here and I think, [we] keep talking about [how] we need more math and science and need to understand technology, and we've got outdated, outmoded requirements for the state."

"We have *got* to get the requirements back into the public school: four years of math, science and English with no substitutes. Journalism, drama, etcetera should be electives. If we don't do that, we're not going to have the workforce that this state needs....What is happening is that we are starting to develop two job levels: one that is service-oriented (low paying--verbal and quantitative skill levels are lower) and another level of technical positions that require high levels--way above what we're turning out at the high school level now--of verbal and quantitative skills. The average high school graduate cannot handle those jobs....There's a real possibility that the general populace in the U.S. will not be educated enough to handle the higher level jobs....Those people who say that the jobs are not becoming technically oriented and requiring more quantitative skills are just not looking at what is going on out there. "

At the postsecondary level: "From my personal perspective, what improving math and science education implies is a better prepared student--students that are ready, more ready to do college-level work. I see a very large range of skill and preparation--from students that are almost capable of teaching [a college course] themselves to those that are almost basket cases and are hopelessly lost."

"As I look at the women and men who are coming back to become certified teachers, they haven't had math, some of them, in 20 years. Those people you expect to have difficulties. But we have some very young people also...and the students come in ill-prepared for college, not because they haven't been taught, but because they have not been taught the things that we are now emphasizing."

Given these comments, it is not difficult to understand why several respondents felt that a priority for reform should be strengthening student requirements in mathematics and science, particularly at the high school level.

Awareness issues

Lower on the list of priorities, but mentioned nonetheless, is a need to strengthen public and parental awareness of the importance of math and science:

> "Acceptance and awareness in the home and society need to be strengthened."

> "There's a lot of training to be done, changing the public awareness of what math and science is about."

One respondent specifically noted a need for programs that involve parents in developing an awareness of math and science.

The purpose of education

Two interviewees discussed the purpose of education on a more philosophical note. One respondent explained why meaningful change in the system may not be easy to realize until the mathematics and science community comes to grips with its expectations of both teachers and students. Referring to an article entitled "The 'Interests' of Science and the Problems of Education" (Eger, 1989), this interviewee summarized the issue as follows:

> "One of the scholars in education writes about the difference between interest *in* science and the interests *of* science. He makes the distinction that interests *of* science refers to the pipeline--producing the scientists and the mathematicians and the engineers and so on--and makes the argument that a lot of what we do seems to be geared toward the pipeline and interests *of* science and math. And the orientation towards preparation of teachers is largely in the interests *of* science. But maybe that's not where our focus should be... [maybe] we should be more concerned about cultivating an interest *in* science, and when we talk about teachers, perhaps that ought to be their perspective--that they teach for interest *in* science, not out of an obligation to the interests *of* science. I think it's an important distinction that's not addressed [but] I think it needs to be addressed if we're going to make progress in strengthening science and mathematics education."

Equity

Finally, several interviewees commented specifically on equity issues, or meeting the needs of underrepresented populations:

> "[We] *need* to address underrepresented populations. [Changing curriculum and instruction] doesn't mean anything if you don't take into account diversity in values--ethos, religious, family, culture, learning styles."

> "We continue to have groups of people who are underrepresented in science and mathematics. And I don't think we have a good idea of why that's the case. I'd like to see more work done in that area."

All of the issues raised were generally considered as highly interrelated, yet analyses reveal different emphases from different respondents. Virtually all "units" of the educational system were singled out for reform by one or more respondents. For example, some claim that *students* need to be strengthened, i.e., that we need better prepared students. Others claim that *classroom instruction and teachers* needs to be improved. *Teacher training* was singled out most often for improvement; *school environment* was also targeted for reform. Finally, others focused on strengthening *public perception* of the importance of mathematics and science.

► Issues or barriers that prevent stronger math-science programs in Arizona

The issues and barriers brought up during discussions with Arizona's key stakeholders in math and science education were as diverse as the areas in need of reform. *Overall system barriers* included lack of a clear vision and the sheer magnitude of change, as the following list exemplifies:

- the lack of a clear vision of what "better" math-science education should entail
- the general lack of information and understanding about reform goals, and change in emphasis in math and science curricula and practices among all players--from administrators to teachers to parents
- the fact that reforming math-science education as a whole is an overwhelming task
- the sheer amount/volume of information to be taught

In addition, respondents noted a variety of *school barriers*:

- poor utilization of funding; program funding held up in administrative levels and spent in other areas
- lack of resources, including money; inequitable resources (e.g., urban versus rural funding)
- lack of time (e.g., for training; to integrate training into classroom practice; to conduct hands-on activities in the classroom)
- student-teacher ratios; lack of aides; class size; teaching loads
- low teacher salaries
- lack of accountability
- current teacher certification standards
- high school requirements in mathematics and science

In discussing barriers at the school level, "poor administration" was a particularly prominent theme. Respondents noted that "decisions often are made exclusively at the administrative level, and do not include the professional educator's knowledge and expertise." They alluded frequently to problems inherent in a "top-down" administration, and commented on the "lack of cohesive leadership and ownership by teachers and principals and superintendents." Several respondents talked about a lack of informed and supportive administrators. They felt that administrators needed to be educated as much as, if not more than, teachers in order to bring about math-science reform. One person described the administrative structure as "inept."

Perhaps in keeping with a theme of poor administration, lack of communication and collaboration also emerged as a topic of discussion. Respondents mentioned problems such as:

- the failure of education to recognize its role as a supplier of tomorrow's workforce; failure to collaborate with business/industry
- a lack of communication among and between levels of the "system" (e.g., K-12, community college, university, state agencies)
- the proliferation of organizations, groups, task forces, etcetera on math-science education and lack of communication among them
- the failure to understand what "true collaboration" means

Attitudinal factors also were perceived as barriers. Several respondents talked about teachers' and administrators' "fear of change." Specifically in relation to math and science, several people also talked about the fact that teachers have developed "bad attitudes" ranging from "anxiety" and "fear" to "belligerence." Mathematics and science curricula, resources, and teaching techniques were cited as barriers as well, with respondents noting problems such as:

- the use of outdated curriculum
- a lack of teacher skills at all educational levels
- the use of outdated textbooks
- a lack of adequate curriculum alignment in science
- the teaching of math in "traditional" ways

Additionally, one respondent commented on the "delivery of in-service (e.g., scheduling)" as a barrier, while several others noted the lack of rewards for excellence in teaching. Some interviewees said that the university research mission only rewards "pure" research--not applied research. Others mentioned that there is no reward system for excelling as a mathematician or scientist *and* as a teacher educator in math or science.

One interpretation of these responses is that while teacher training improves some aspects of mathematics and science education, little significant change can occur without changes in the current educational structure. This structure is one with few rewards, too many classes to teach, too many students in each class, too little classroom assistance, outdated textbooks, inadequate materials to conduct hands-on mathematics and science instruction, too little time, and very little administrative support to change the status quo.

It is a system which expects too little of its students in terms of state requirements and, to date, is not sufficiently accountable for itself. It is a system that discourages collaboration between school districts and the university due, in part, to the lack of emphasis by the university on *applied* research in schools. It is a system rampant with separate organizations, funding streams, and well-intentioned "change agents" who do not know each other.

In short, while better teacher training may help math-science education at the margins, reform to the *system* of public education is the more important source for improvement in these areas.

II. IHE PROGRAMS:
What elements make a successful math-science in-service program?

To answer this question, six areas for investigation were defined using criteria from federal and state guidelines governing IHE programs: 1) delivery systems/partnerships, 2) content/curriculum taught, 3) selection criteria for participants, 4) criteria to assess program quality, 5) evaluation methods, and 6) dissemination activities. Each of these areas will be explored separately in this section.

▶ Delivery systems/partnerships

According to federal and state guidelines, IHE programs require a "partnership" with one LEA or more, and encourage partnerships with business and industry. Morrison Institute analysts were interested in what is viewed as a "successful" partnership and in developing a better understanding of roles of respective partners (i.e., IHEs, LEAs, business/industry) in a successful venture.

Elements of successful partnerships

The predominant theme that emerged from an analysis of the data is that a "successful partnership," or one that is most beneficial, is one in which there is an *equal, cooperative relationship* that is *sustained over time*. Equality and the duration of a relationship were used to define a successful partnership regardless of the partners (i.e., IHEs and LEAs; IHEs and business; LEAs and business). The value placed on these characteristics is evident in the following statements:

> "...the notion of a partnership is that people go in to partnerships as equals--not as somebody who is going to go it to save the other. And, the results of partnerships is a change in both parties....Those kinds of partnerships that involve both sides are clearly going to result in far better results."
>
> "In true partnerships, the proposals and grants would be developed as partners, where teachers and university faculty meet as peers."
>
> "A successful partnership is one in which both parties contribute and benefit equally."
>
> "In my view a successful partnership is a productive, mutually-beneficial relationship that outlives the funding cycle."
>
> "In our case, we already had an on-going relationship with the group we are working with...and I think, in fact, that when this project is done, that will not be the end of it. We will be continuing to work with them in some way. I think there is a willingness to keep on working after the relationship is 'officially' over."
>
> "The best partnerships are problem-based. The partners come together saying we have a *common* problem that we need to solve, and here's the problem. We're not going to design a solution ahead of time, we're going to simply identify the problem and demonstrate our commitment to working on the problem. And each party shows that [they] have both willingness and expertise toward addressing that problem, then actually sit down and work on the problem."

Cooperative, long-term relationships are seen as beneficial in allowing for the exchange of information, or a transfer of knowledge, in both directions. The respective roles of institutions of higher education and local education agencies within a successful partnership were described by respondents as an "essential symbiosis" and "reciprocal relationship" wherein IHE partners provide expertise, resources, and innovation.

Expertise: "Basically, the role of the university is to keep current with the literature in science and mathematics education."

"We think that what [universities] really have to contribute that is most valuable is their mind, their knowledge, their expertise, their perspective."

"The role is to bring together a very deep, sophisticated understanding of content or instructional methods to a very practical application in an attempt to help teachers translate that knowledge into a learnable form by children of different ages."

Resources: "We have greater resources in many ways than any pre-college institution. We have a planetarium, we have laboratories, and these are things that can fire a student's imagination."

"The opportunity to *do* research is at the universities....The misconceptions about what its like to do research are incredible--what its really like in a lab.You bring those people in--both teachers and high school students--and the first comment that you get is that: 'The people aren't the way I expected them to be.' People's vision is a lone scientist in a lab. [Institutions of higher education are] incredibly up-to-date in information and resources."

Innovation: "[Institutions of higher education can play] more of an innovative role. [They] can bring some interesting approaches to the teaching of math."

"The universities should fulfill the role of a development and innovation center. They should deliver innovations to the schools."

With respect to LEA partners, most respondents felt that the primary role of an LEA is to communicate their specific training needs to their university partner, and to work in close collaboration with their partner(s) to plan and implement a program.

"In an ideal world, the partnership would be the needs assessment of the school district, the articulation of ideas with the university and teachers, and how we move forward to solve it."

"[LEAs] need to inform us at the micro level. They need to keep telling us about the local school community, tell us the nuances of things."

"It would be better to get more input initially [from the LEA]."

"The role of the LEA in a partnership is to work with the collaborating partner in establishing mutual goals."

As partners in education, the role of business and industry is somewhat controversial. While many respondents felt that business and industry has much to offer, others felt that there is a lot of "hot air" surrounding the role of business and industry in education.

On the positive side, businesses are seen as valuable resources who contribute in ways such as:

- hiring teachers for summer positions to help them upgrade their skills
- allowing employees release time for teaching in the schools (for short periods of time)
- contributing funds to purchase capital equipment
- evaluating curriculum to help determine its relevancy to the world of work

Businesses are also seen as playing a crucial role in communicating to schools what skills are needed to enter the workforce. Finally, several respondents felt businesses have much to offer educational decision-makers because they are an integral part of a community.

On the negative side, several respondents felt that there has not been a substantive commitment from businesses to engage as partners in education. Rather, there have been a few "points of light" for appearances. In the words of another respondent:

"I haven't seen a whole lot very positive about partnerships with the business community. I think its mostly been 'eyewash.' I think, at best, what's come out of it is industry having released some time for some of their employees to visit in schools and do a little teaching in schools and bring in a little of the expertise in their particular field. Overall, I think that does more to make everyone feel good than it does to improve the education of the kids--I hardly think that business fits in."

One respondent clearly stated: "I don't think that it is feasible to expect this--I think it is naive."

In the course of responding to the idea of "successful partnerships," many national groups also were mentioned as useful program partners, although they appear to play a small role in comparison to LEAs and universities. Many groups referenced are discipline-based and serve as a means for program directors to network and gain additional information regarding such things as resources and programs.

Problems establishing successful partnerships

Several interviewees noted that IHE partners, historically, have alienated LEAs. Some interviewees claim that it is difficult to develop "successful" partnerships with LEAs which have had "bad" experiences with universities in the past.

"You get back to this issue of who has authority over whom and who works where."

> "They [LEAs] will not produce anything if they're dictated to....So we really need to get everybody, especially higher education, to take the role on of being a participant rather than the patriarch."

> "I think the universities do have a problem of wanting to be agents of transformation, transforming the schools, and in the end, being agents of alienation instead."

In contrast, one respondent notes:

> "I think they [LEAs] need to get the chip off of their shoulder about the universities and...need to realize that the university is involved in training people for advanced degrees and for research and that if they [the university] are going to give a class, it has to live up to those standards."

From the IHE point of view, there are several problems that inhibit faculty involvement with partnership programs. One theme concerns a perceived lack of university-based support for these types of collaborative programs. This theme is evidenced by the interview excerpts that follow.

> "Budgets are extremely tight, people are being laid off. The amount of support we get many times from the university is minimal....it's sort of you're just fighting the system to be allowed to do things. If you do something [like this], you tend not to get credit for it in the departments or, when promotions come up, it's an issue that you should not be doing it--you should not be taking away from your [undergraduate] science training."

> "Undergraduate education seems to be the important thing, and education beyond that--working with the community--it's not valued here....It's not valued from this end but it sure is valued from the teacher's end is what I hear."

> "I can tell you that it's time for us [universities] to help the secondary schools and not sit back and say the students are not sufficiently trained for us to work with--that's a cop out. We need more commitment on the part of the faculty and the administration to collaborate....We ought to have more students go out into the high schools as interns and apprentices and...we need more professors devising curriculum and helping train teachers."

Several respondents also felt that there was little incentive for LEA teachers to invest in a partnership program. Problems were noted in lack of both financial and administrative support, as the following comments illustrate.

> "Release time seems to be a big issue. It's not an issue of money, it's an issue of time. They should be given time for planning."

> "Back in the old days, financial support is something we knew we could get and release time. But not anymore....I think part of it is [the LEA] bureaucracy--the frustrations of the people we have to deal with....If they want $500 to support us, they have to go to the school board--literally--so they have to convince the school board that this is something that needs to be done. There's no flexibility."

> "Some districts have science coordinators or superintendents who want to be very aware of what teachers are trying to do in science and math. This is not half of them, even. So, usually, at that level you sort of get a token letter. We need to have a way to work to enlighten the administrators, but at the time when you're usually submitting [proposals] and putting them in, that's not the time...you can enlighten the administrators after the fact--after you hand them something wonderful in their classroom to show them. They don't see it ahead of time very often."

In relation to partnerships with business and industry, several respondents felt attitudes on both sides prohibited successful partnerships. One felt that the universities have done a very poor job interfacing with business. Another states: "There needs to be a realization among certain businesses and industries of what they really represent. It's often been explained to me what the business model is--and that business model is a different model for every individual business. It's *their* model. And sometimes they don't realize that."

But beyond universities' attitudes in dealing with business, or businesses' attitudes in dealing with programs, a very real barrier has to do with geographic location. As one respondent noted:

> "Ability to form partnerships varies greatly depending upon rural or urban or geographic setting. Some places it's easy and other places almost impossible. In rural areas, it's almost impossible to get a substantial business partner that can contribute significantly."

Finally, two interviewees' specifically noted interagency partnerships--or lack thereof.

> "It seems to me that everybody is working separately. The ADE has its own things, school districts have their own things."

> "I think the weakest link in any of our programs is the ADE....it's this articulation of government."

▶ Content/curriculum taught

A diverse number of projects are funded focusing on different kinds of subject matter. Some might criticize these as providing a "one-shot" opportunity for in-service training. The question was asked: "How could the Eisenhower IHE programs be strengthened in terms of what is taught?" or, alternately, "What *should* be the emphasis, if any, on the subject matter of the in-service?"

In terms of the first question regarding strengthening IHE programs, one leading theme emerged. Many respondents felt that programs should be funded for longer periods of time. They felt that the Board should view programs "in terms of long-range planning." A clear message came through to "quit doing one-shots" because they do not make a difference, and to begin to fund longer projects. How could Eisenhower be strengthened? Respondents suggested the following:

- longer term projects
- summer institutes that are longer in duration
- three year projects--not one year
- multiple year experiences

As one person commented, "Eisenhower needs to be looked at as an investment, a long-term investment, and it can't be done in these very brief periods--like this forthcoming one.[1]"

As far as what *should* be the emphasis, if any, on the subject matter of the IHE programs, a majority of respondents felt that content should be decided by the grant writers. Of course, many stipulated that content should be selected to correspond with LEAs' stated needs, preferably as a result of conducting a local needs assessment. As one person reflected:

> "Each school is at a different stage in the improvement/reform process. [One] needs to do a needs assessment [to determine content]. You can't write a generic prescription for all."

Apart from the subject matter, almost all respondents wanted to ensure that IHE programs focus on the practical applications of the content. Therefore, "hands-on" approaches were emphasized as well as a need to help teachers "translate" content into instructional curricula. For example:

> "Teachers need help in knowing how to translate the content into curriculum kits, so now we're talking about how you can take that content and put it into the context of a thematic unit that also integrates that content with language arts and social studies."

▶ Selection criteria for participants

Clearly, federal and state guidelines place an emphasis on the recruitment of minorities and other underrepresented populations for participation in IHE programs. For Arizona, Morrison Institute researchers wanted to know about techniques that have been used in the IHE programs to successfully recruit minorities and members of other underrepresented populations, as well as about any perceived barriers that remain to minority access and achievement. The intent was to determine how minority representation could be strengthened.

One of the problems with both state and federal guidelines, through the eyes of several respondents, is that they are ambiguous. There is some confusion regarding whether IHE programs are required to recruit minority and other underrepresented group's teachers *or* whether teachers who are recruited simply must work with significant numbers of minority/underrepresented group students. One respondent noted that "We have all gone to where all of our teachers are ethnic minorities or are from rural areas." Yet another stated that, "If you only work with minority teachers, then you may not reach the minority students."

No one was opposed to recruiting and serving teachers from underrepresented groups. However, at least two respondents noted that minority teachers don't exist in large enough numbers in Arizona to warrant a primary or exclusive focus on these populations. Furthermore, they stated that certain requirements which emphasize serving minority teachers diminishes their ability to recruit people for their workshops. Rather, they would prefer to see a stronger, more explicit emphasis on teachers who work with students from underrepresented groups.

[1] This refers to the 1992 competition which provided funds for a nine-month period.

Specific recommendations for recruiting teachers from underrepresented populations include:

- Base projects where minorities live.
- Use minorities to recruit participants.
- Ask districts for *their* advice on how to recruit participants.
- Do mailings to *all* schools in the state--especially those with high minority populations.
- Develop a linkage/partnership with the Arizona Association of Bilingual Educators.
- Develop contacts with others who work in Chapter 1 schools.
- Require at least one-half of the participants to be in Bilingual Education.

As for how IHE programs can strengthen minority participation, one respondent said:

> "I think that [ABOR should] clarify it by saying that the projects either work directly with classrooms or directly with schools...[and] that participants who work in schools have kids that represent the underrepresented populations, including low economic."

▶ "Quality" criteria

Recent federal changes in the Eisenhower program request evidence of a program's "quality," defined by the following six criteria:

(1) The program's relation to long-term improvement goals;
(2) The program's ability to allow for integration into understanding and implementation;
(3) The program's relation to classroom assignments;
(4) Whether or not the program includes professional teams (rather than individuals) that can work with each other over time;
(5) Whether or not the program provides follow-up activities or reinforcement activities or both; and,
(6) The administrative and policy support of the school of LEA.

In addressing this topic, Institute analysts asked the 48 key stakeholders *their* reactions to these criteria, as well as asked them to define their own criteria for defining a "quality" program. Their responses to these questions follow.

Criterion #1: The program's relation to long-term improvement goals

There was a great variety in the responses to this question. Many of the Eisenhower program respondents were unable to specifically state how their programs achieved this criteria. However, many of the respondents had specific opinions as to what should be done in relation to long-term improvement.

One felt that programs best relate to long-term improvement goals when planning is done methodically (i.e., overall goals are identified and the objectives and activities necessary to achieve that goal are specified). Others felt that the programs can relate by being up-to-date in subject matter or teach skills that can be applied to multiple disciplines. Still another felt that empowering teachers is a key to long-term improvement: "I think almost anything that will empower the teachers to get in the classroom and deliver the materials is going to help in the long term."

Four specifically stated that *long-term funding* for programs was necessary to achieve long-term improvement. They felt that funding levels should enable programs to run year-round and for more than one year. One program director noted they have a three year plan in place, even though Eisenhower funding is only for one year because they know they can not make desired changes in less time.

> "That's one thing I would like to see. That a program doesn't just disappear after on year and then a new group of things get funded....You have these one year type fundings where then you're going out for all these new sources to continue that."

> "It needs to be an important criteria that it's not a one-shot--that not only is it going to be over the duration of the funding period which is one year to a year and a half, but their ought to be some provision at the end for it to continue after the funding."

Four respondents identified *follow-up* as the key to long-term improvement. They noted that the ability to follow-up provides interesting information and allows one to see if the program goals are attained.

> "Part of the whole thing is that I am always there and they [teacher participants] know they can call. There's always someone who's interested in what they are doing mathematically."

> "We have long-term follow-up and we try to follow teachers and/or students and see what the outcomes are".

Criterion #2: The program's ability to allow for integration into understanding and implementation

Of the responses to this question by iHE Eisenhower projects, three respondents stated that this type of change can only occur incrementally, over a long period of time.

> "I look at turning a program around as attempting to turn a huge ship in the ocean or a big airliner in the air. If you want to turn it around and get it going in the other direction you better plan for a big radius to move that thing around...so we have to look at the overall program, and its not just one teacher going out there and doing an outstanding job integrating into their classroom. We've got to look at the whole thing."

> "You don't bring about change in curriculum, instruction and structure overnight--change is a long process. You start by trying to integrate those things...into one or two teachers' classrooms, into a whole grade level, into a whole portion of the school."

Other respondents felt that criterion of quality is achieved through various methods such as:

- use of hands-on activities whereby teachers are given samples from each activity to take with them
- workshop tasks that are open-ended to facilitate a lot of discussion
- constant evaluation of what is being done so changes can be made--the program can be redesigned if necessary to achieve the long-range goals

Criterion #3: The program's relation to classroom assignments

Most respondents felt that this is a key element of quality. Four IHE Eisenhower respondents commented specifically on the fact that their program's activities were directly related to classroom assignments. One program is designed to run parallel to classroom assignment because the purpose of the program is to work with students in math and science while their classes are in session. The "...classroom assignments are the focus of the program."

The philosophy of another program is that students can't learn science or math without daily homework which is evaluated by the teachers. By using the same materials/subjects that the participant-teachers use in their classrooms, trainers can show them how to implement more effective teacher methods

> "We didn't make that 180 degree turn--they're still teaching the same thing only you're going to get there in a different way and you're certainly going to have a different goal."

> "We tried to help them think about how to find material suitable for their classrooms....We do a lot of modeling of instruction."

Three other respondents stated that they did not attempt to achieve this criteria, because it was not the intent of their program. In one case, there was no relationship between the content of the workshop and classroom activities because the goal of the workshop was explained as exposing students to things *not done* in the classrooms. Similarly, no relationship existed in a second program because the content was deliberately made different from that in the classroom. Finally, in a third program, its purpose was explained as "to give teachers knowledge instead of concrete lesson plans [because] they need to be able to customize the knowledge to their own classroom."

Criterion #4: Whether or not the program includes professional teams (rather than individuals) that can work with each other over time

Five respondents indicated that programs *had* included professional teams. Advantages of teams as were noted as, for example, more successful implementation of training when teams from the same school participate. Expanding upon the team concept, suggestions included the following.

- Encourage at least two teachers from each school to sign-up for workshops.
- Make workshop modules team-based.
- Encourage inclusion of administrators in teams.
- Encourage partnerships that transcend concept of teacher teams: use teams of teachers as peer coaches and expand team concept to include others such as business/industry representatives., principals, and parents.

As one person commented: "You've got things like having a school community working towards common goals...so it's not just the individual classroom on their own. We've got to break down the walls between teachers."

For various reasons, other respondents replied that teams were not either used or felt to be essential. In one case, teams were not required because trainers felt that "natural teams" develop among teachers who have been in several workshops together. Other reasons for not using teams include:

- the location of project does not facilitate the formation of teams
- participants are drawn from a pool of teachers that know each other from other workshops but are not necessarily from the same schools or districts
- participants are children, not teachers

In one case, a lack of resources was felt to prevent more than one teacher in a school from being released for training. Additionally, two respondents stated that teachers were too mobile, moving around a lot. They felt that too much time can be invested in forming teams only to have them break apart, as the following comment illustrates:

> "If you get a team from a school you probably have a bigger opportunity in that one school to make an impact for awhile. Teachers are still mobile though. That is our whole problem. If you start saying we want a team, you get a team then they move away."

Criterion #5: Whether or not the program provides follow-up activities or reinforcement activities or both.

While follow-up and reinforcement activities were supported, funding constraints were cited as a limiting factor in being able to offer these types of activities. Lack of time was given as another reason for not providing follow-up. However, several Eisenhower respondents stated that both follow-up and reinforcement activities were conducted as a part of their program:

> "We have basically three follow-ups: visit with them in the classroom--and not to observe them, that's not what visitations are for. It is to meet with them during their planning periods and ask: 'What help do you need? What can I help you with? Do you need me to go over a lesson with you?' Or they'll come up and say, 'Do this again for me. I've forgotten how to do it.' Those are the types....The second thing is another four-hour meeting with them and their third thing is the in-service that they must plan. And they are being paid for the four-hour meeting and to plan and conduct the in-service."

> "...we went to schools in the fall following summer programs. We observed, did a miniature case study--the impact of that team on the school."

Some stated that only reinforcement was provided (e.g., take-home materials were given to participants), while others mentioned only follow-up activities. Another respondent stated that they were making efforts to put out a newsletter to all participants, but funding constraints were limiting this attempt. Additionally, one person suggested establishing a communications network so that teachers could use E-mail and similar technology to stay in touch and network: "...to a great extent we're still working 20 years behind ."

Criterion #6: The administrative and policy support of the school of the LEA

Everyone who responded to the question felt that administrative support is essential, yet not everyone felt that they had this support. Those who responded that they had LEA support emphasized the importance of this partnership:

"[We] involve the administration in the selection of participants. They know that they need the training and stronger teacher teams so the support is there. Also, getting letters from principals guaranteeing teacher release time and support can be very important."

"[Name of district] at the level of science administrators is extremely supportive. Try to go a level higher than that and you're into such red tape."

"The approach I have...is that I try to let the teachers know that it's OK for them to have requests from their administrators. But they should be saying they need support."

"One of the things that's been really helpful in our project is that we had initial sanction from the school board and the central district offices. We've checked in and involved them whenever possible, but in many cases it takes some leniency in the policies.... The school community has to be empowered more than it has in the past and, in order to do that under the current system, we've got to have an OK from the central office and the school board. One of the ways to get that is to communicate every step of the way with them and involve them in the process of decision-making."

There were two reports of difficulties with LEA administration. Difficulties involved lack of follow-through by administrators, lack of enthusiasm and, in cases where more than one district was involved, varying degrees of cooperation preventing the standardization of any procedures. Unions and bureaucracy created most of the difficulties. Another respondent said that the LEA simply gave it's permission and did nothing else to support the program.

What criteria do <u>you</u> believe define a "quality" program?

The majority of respondents answering this question cited evidence of quality in terms of "outcomes." Two simply stated that outcomes should be measured while six were more specific in defining what should be measured. Examples of what should be measured include:

- the effectiveness of new materials and/or techniques used by classroom teachers
- change over time in teachers' attitudes
- teachers' integration of new skills in their classrooms
- what the program states it is trying to do
- changes in students

The following comments illustrate the importance given to "changes in students":

"[We should be measuring] whether or not there is significant change in students. In an environment like [ours]...they have 70% unemployment, three quarters of the population suffers from diabetes, they have tremendously high rates of alcoholism, drug abuse is very common...so success there should be measured in the numbers of [district] students who continue to pursue an education and who are successful at it. This should be defined by program and population."

"[We should be measuring] the extent to which you can get the kids involved in creative things....Does it improve the quality of their life? Does it make them more successful

students? Does it get them more excited about things or give them a new vista to choose from?"

Four responses dealt more with methods of measuring quality. At least two respondents expressed opposite opinions on the value of "pencil and paper" tests. One felt that such tests provide a valid measure of student performance, while another cautioned against such tests because "many of the changes are too subtle to be measured."

Another person said the mark of quality is that it is customized to the local classroom, rather than an exact replication of a program that works in another location. Still another said that requisites for program excellence include a good LEA partnership, good personnel and good criteria for program participants. Two responses stated that quality required a program to be well-planned, which includes doing needs assessments in schools and defining state-level macro and micro issues.

▶ Evaluation methods

In Arizona, as in other states, two issues are at the heart of evaluating IHE programs. The first issue concerns what kind of evaluation is appropriate for an individual project. Historically, a problem has been that local programs vary with respect to the strength of their local evaluations. A second issue relates to statewide evaluation. Currently, there does not appear to be a systematic effort to analyze or report individual program results at the state level. Given these circumstances, interviewees were asked the following questions:

For local programs:

- Given that increased accountability is here to stay, what can/should be done to strengthen local program evaluation?
- What should be the criteria for assessing program success?

At the state level:

- Given that increased accountability is here to stay, what can/should be done to strengthen state-level evaluation?

Of 28 total responses to this set of questions, 25 (89 percent) responded to the question on local-level evaluation, 21 (75 percent) responded to the question on state-level evaluation, and 19 (64 percent) responded to both questions. There was some overlap between the answers to local and state-level evaluation. This appears to reflect the fact that many respondents view math-science evaluation improvement as a state, or system, problem rather than a local problem.

Local level evaluation

A number of weaknesses in local-level program evaluations were noted by respondents. Some of the problems that were identified include:

- inadequate definition of goals and objectives
- lack of expertise in evaluation methodology
- lack of authority and other constraints (e.g., time constraints)
- lack of clear evaluation requirements in RFP

Two respondents addressed the issue of goals and objectives. One felt that many program directors were tempted to set easily achieved goals and objectives so success would be guaranteed while another felt the problem was that goals and objectives were not based on the results of LEA needs assessments.

An additional concern expressed by several respondents focused on the lack of expertise in designing and implementing an evaluation. Time constraints resulting from the Eisenhower grant time frame, as well as constraints imposed from other sources, were frequently mentioned as being problematic. Nine respondents specifically addressed the lack of ability to use longitudinal measures. The most recent nine-month time frame of the grant was addressed by one respondent as only allowing time to deliver the program and not evaluate it. Another respondent stated that time constraints forced them to use standardized tests rather than other measures which would more adequately evaluate student and teacher outcomes resulting from the program.

Three respondents mentioned their lack of control or authority to ensure that evaluation activities are followed-up at the local level. Specific problems were a lack of control over being invited into a participant's classroom to observe, lack of time or motivation on the part of participants to respond to evaluation requests, and pressure from other partners to use specific, quantifiable measures which are not the program director's first choice.

Four respondents felt that problems exist in the RFP requirements. Specifically, respondents felt that Arizona Board of Regent's expectations for evaluation are unclear. Respondents recommended that the Board be specific, and set evaluation standards. A related criticism was that the Arizona Board of Regents does not follow-up or provide feedback after program evaluations are submitted. Another stated the perception that the Board gives only "a cursory review" to project evaluations.

Many solutions were offered in reference to strengthening local level evaluation. A predominant theme centered around the provision of *technical assistance* in evaluation, as illustrated by the following recommendations.

- Provide expertise in evaluation methodology.
- Provide evaluation experts as consultants.
- Provide workshops at the university level on how to evaluate or provide names of contact people who would serve as resources.
- Establish a university campus evaluation unit.

Another set of recommendations focused on *who should be involved* in conducting a local evaluation.

- Establish evaluation teams comprised of "outside" individuals for each project (ADE or ABOR).
- Use evaluation teams.
- Program directors should be doing site visits.
- Involve partners in the evaluation process.

Other respondents focused on *ABOR's role* in focusing local evaluations.

- Set clear standards for either an "outcomes" or "process" evaluation, or both.
- Provide sample models of evaluations in RFP.

- Don't award grants unless evaluation is adequate.
- Bring in an evaluation expert to sit on the RFP evaluation panel.
- Separate the state and federal evaluations.

Still other comments focused on the *methodology* of an evaluation.

- Establish long-term evaluation mechanisms.
- Evaluate students and not teachers.
- Conduct a formal study with a control group (i.e., Did the teacher bring something back to the students?).
- Offer as much support as possible to help teachers initiate changes and use of materials in the classroom.

When asked what criteria should be used to measure program success, three respondents suggested that program success should be defined in terms of achieving project goals. According to one respondent: "Success can't be measured until you know what you are looking for and I think one of the problems is to define what we're looking for."

Other respondents cited specific criteria that could be used to measure success. For example:

- students' test scores, grade point averages, and courses taken
- the replicability of the program
- changes in teacher-trainee and student attitudes
- changes in teacher-trainees' content knowledge, ability to use new strategies, and/or personal values

Producing changes that persist over time appears to be a predominant goal for many involved with Eisenhower programs. This goal underlies the emphasis many respondents placed on measuring program impact over time using longitudinal studies. Respondents noted that program effects can be measured meaningfully *only* through a longitudinal study.

According to one respondent, *if* the Eisenhower grants can not be used to support longitudinal studies--which are how desired outcomes need to be measured--*then* perhaps the Arizona Board of Regents should undertake that role at the state level. One suggestion was for ABOR to devise an evaluation methodology that could serve as a longitudinal measure of success.

State level evaluation

Responses to the question on strengthening state-level evaluation were diverse, but strong resistance to state-level evaluation was expressed. For example, six respondents felt that attempts at state-level evaluation are "futile." One respondent directly stated a lack of confidence in the ability of ABOR to conduct a state-level evaluation well. Also addressing ABOR's role in state-level evaluation, one respondent noted:

> "I will predict that they'll [ABOR] put someone on it and spend the money to do it. They are going to spot check and they are just going to be wasting your money....In order to do it right it will cost them too much money.."

Another person stated that they doubted that "there would be any real difference from program level evaluations." Several respondents felt that state-level evaluations are of little value due to the differences in each program which necessitate different evaluation methods. To conduct a state-level evaluation is, in the words of one respondent, "a typical bureaucratic solution that will not get you anywhere. It is typical to require an evaluation, and if it's not working to not do it any more. What we ought to be doing is to look at programs that are successful based on their own criteria and continue funding those programs." In sum, the consensus among one set of respondents is that the imposition of state-level criteria across all programs will not measure what is and isn't successful.

In contrast, another group of people responded that looking at all programs is necessary. One person noted that state-level evaluation should focus more on "the overall policy" as a standard for evaluation. Another stated that: "making connections with these people [i.e., local project personnel] to get a big picture of the framework is very helpful." Still another suggested that all programs should be visited by the same person(s). Finally, one respondent recommended having a group to do case studies "as a check against what is proposed to happen."

Some respondents dealt with specifics of how to conduct a state-level evaluation. Two people stated that a more formalized study such as a meta-analysis or an experiment with control groups should be undertaken to determine what works. One suggested that programs be required to submit "real data" and not rely upon questionnaires for results. Another stated that site visits should be conducted. One person advocated the use of Arizona's *Essential Skills* and Arizona Student Assessment Program (ASAP) results as measures of program success at the state level.

In support of state-level evaluation, several people felt that this is one way to determine "what works" in mathematics and science training and education. Along these lines, one person recommended that previous applicants be identified and used as resources to identify what is best.

Finally, one person noted that a state evaluation should, in essence, serve as part of a statewide needs assessment: "I think we need to take a look and put the effort where the weaknesses are. And that's not hard to tell. The testing programs will tell that. And what's interesting is that those are not the places where the grant monies are going." This person believes that reservations and areas heavily populated by minorities are not getting grant monies. Furthermore, the respondent claims that if an overall measure were made and each geographic area examined, then program inconsistencies would be apparent.

Comments linking program-level and state-level evaluation were natural. Criteria that were common to both included the need for longitudinal studies, the use of standardized measures, and requirements to clarify evaluation requirements in the RFP.

▶ Dissemination activities

Some interest has been expressed in improving the dissemination of information about "what works" in mathematics and science education throughout the state. In light of this interest, interviewees were asked about how they disseminate information about their programs, the kinds of dissemination activities most beneficial to them, and their suggestions for improving the dissemination of information about "what works" in mathematics-science training and education.

As discussed by respondents, dissemination activities occur primarily at and/or through:

- local, state/regional, national meetings
- workshops, seminars, in-service
- newsletters
- publication in professional journals, non-education journals, journals that teachers read
- word-of-mouth

Of all methods of disseminating information, 11 respondents stated that they received information primarily through presentations, particularly at meetings of national and/or state associations. Among the specific groups mentioned were the National Science Foundation, American Association for the Advancement of Science, Arizona Science Teachers Association, and Arizona Association for Bilingual Education. Formal presentations and publications in the journals of these organizations seem to be one common way to get the word out. At the national level, presentations are done primarily by university program partners. At the state or local level, LEA participants often are the presenters.

Although state-level meetings are one of the most common ways for disseminating information, some people interviewed criticized the quality of state/local level presentations. One respondent described a state level effort at dissemination to be very boring and "beyond abysmally organized".

Seminars and workshops at a local or state level, and in-services conducted by participants in their own schools, were the second most frequently mentioned method of obtaining and disseminating information. Newsletters, published articles, and word-of-mouth or networking all had four respondents each. Less frequently mentioned methods of obtaining information were brochures, electronic communication, and partner or consortium meetings. Three respondents indicated that their ability to get information was limited or they simply did not see it as being done.

Newsletters were mentioned by four respondents as a means of dissemination. Program directors use association-related newsletters, while a few programs generate their own newsletters. Regarding the latter, this is considered difficult because of limited funds to produce newsletters.

Word-of-mouth or networking, although mentioned as a major method of disseminating information, is not perceived exclusively as positive. For example, university staff mentioned that communication is poor even among other program directors on their campuses, much less among program directors elsewhere. University respondents expressed a lack of knowledge about what their colleagues are doing. At the LEA level, word-of-mouth of workshop participants is common.

Among the more unique ways to disseminate information, one respondent stated that they have teacher-participants in each workshop design their own T-shirts. T-shirts reportedly have generated many inquiries when participants wear them, and information is then passed along by word-of-mouth. Another program director mentioned using sales and marketing techniques found in business to get the word out. For the most part, how projects disseminate information seems to be at the discretion and expertise of the project's director. Those at the university level prefer professional associations or journals where the information is disseminated to their peers. Those who are move involved at the local level prefer the state level distribution of information through newsletters, workshops/seminars, and statewide science and math teachers' meetings.

Dissemination activities perceived as most beneficial, in order of priority, are:

- professional meetings/organizations/conferences
- networking/person-to-person
- publications/written summaries
- local workshops

Recommendations given for improving the dissemination of information are as follows.

- Develop publications/newsletters/catalogs.
- Improve dissemination at state-level meetings.
- Develop/improve electronic communication (e.g., E-mail; databases).
- Create a speakers bureau.
- Require projects to publish in a journal.

III. ROLE OF ABOR/POLICIES

Respondents were asked specifically for their recommendations on what could be done by the Arizona Board of Regents to improve its own policies and procedures relative to Eisenhower projects, as well as to comment on any policy changes that could potentially strengthen Eisenhower programs. Responses clustered around the following themes, each of which is explained in greater detail in the sections that follow.

- Distributing the "request for proposals" (RFP)
- The RFP document
- The grant application review process
- The overall administration of the IHE Eisenhower program

As a preface to this discussion, respondents fell into three basic groups. There were those who were unfamiliar with the IHE Eisenhower programs, and therefore were unable to make substantive comments regarding the Board's administration of the program. There were also a few first-time IHE grantees who, because they were funded, generally perceived and expressed satisfaction with policies and procedures. Finally, there were those with multiple and varied experiences with the Eisenhower program through the years. It is largely, though not exclusively, the latter group's input upon which this discussion is based.

▶ Distributing the "request for proposals" (RFP)

Two issues surfaced regarding "getting the word out" to potential IHE Eisenhower proposers. The first has to do with the frame between when RFPs are sent and the submission deadline. The second issue focuses on who receives the applications.

On one hand, several respondents felt that there was not enough time to respond to the RFP, as the following comments indicate:

> "The RFPs come out very late....I think you need more time than that to just think through the structure. A lot of them are this way. Maybe if you're on the 'in,' then you'd

> know when these things are coming out and you could prepare. But how you get in that position, I don't know."
>
> "I don't think we had enough time to really do the proposals."
>
> "If you're going to work in-depth with LEAs and respond to that--if you don't have an ongoing project already being working on--probably a little longer responde time would help."

On the other hand, a majority of respondents either did not note a problem, or felt that the "lead time" to respond has been adequate.

> "We get the notices about the RFPs in plenty of time to be able to submit, and compared to a lot of other agencies, they let you know quickly whether or not they've rejected you or you got funded."
>
> "I personally feel they have come out early enough. In other words, the time frame has been good enough."
>
> "The time frame is adequate--most people do it during the last two weeks anyway."

Regarding the dissemination of RFPs, several respondents felt that a broader audience should be targeted.

> "I can always find them [RFPs] because I know when they're coming out, and I start calling around....But then, that's the case of the ones that are involved in it and they're always the ones that know about when they should look for it. I think you could disseminate RFPs to a larger audience that might be connected, and some school districts might actually form together types of consortiums that might apply for those. And then I would like them [LEAs] to contact higher education institutions...instead of higher education institutions contacting the LEAs and things like that. I think what I'm trying to say is probably a broader range of dissemination would be useful--that you might get a diverse set of proposals written."
>
> "[ABOR] should really concentrate on new awardees. There is certainly some need to go to the universities, but I think some more might go to the community colleges and then to some other organizations...who are doing a fabulous job with teacher training and working in math and science. I think they need to extend their bases--their boundaries for giving awards."

▶ **The RFP document**

Although there were some respondents who felt the RFP to be adequate and representative of RFPs in general, more frequently, the RFP had few advocates. Some criticism focused on the document as a whole:

> "The rules should be as broad as allowed by Federal law. Things allowed by the Feds are arbitrarily left out of the RFP."

"The information that they send out in their RFPs could be arranged in a manner that's easier to follow. They are certainly not the most clear things, but a lot of them [RFPs] aren't. I think they could do better."

"I thought about submitting a proposal this year and didn't. It seemed to me that the list of regulations and do's and don'ts has gotten much longer....I felt that it wasn't worth the effort to apply--there was such a long list. It seemed like such a complicated process--I mean it was as bad as filling out a 1040 form with all kinds of deductions and things. I can see how someone would say that 'Gee, this isn't worth the trouble.'"

Other criticism was leveled against specific aspects of the RFP. These are summarized by topic, citing comments that reflect the pros and cons of each area.

On the kinds of proposals solicited...

Pro: "One of the things that was helpful, has been helpful in the prior Eisenhower IHE grants is that there have been targets or there have been target areas of focus that have been identified. So that tends to cut down the amount of shotgun proposals, so that you are all focusing on, say, working with minorities or rural districts. And that's helpful. I'd like to see that continue."

Con: "It is not organized in a way that systematically impacts what is going on in schools for the preparation of teachers. I think problems need to be identified that are at the policy level. For example, the Board needs to say we want to work on the science preparation of elementary teachers. They may have too many initiatives. Then they would say we're going to surround the project and we want that to happen in certain kinds of ways. We're not looking for just any project, but we want to look at the development of post-secondary educational experiences for elementary teachers in the area of science that integrate subject matter, that focuses on specific understanding of the discipline, and its translation into pedagogy. Real narrow kinds of things. The point being that if you fund a dozen of those then you begin to get the answers to some questions. On the other hand, if you are so broad, you get a dozen but they are real closely related to each other. You can't form conclusions about what's going on--what's going to move this forward. You can't get any concerted effort."

"The current system encourages individuals going off and creating a proposal that has all the nice words to match the guidelines. What it does *not* encourage, and this is what I would like to suggest, is it does not encourage collaborative proposals--proposals where groups of individuals can collaborate.

On the emphasis on ethnic minorities...

Pro: "The present policy if targeting minorities and teachers of science and math in minority-rich schools is exactly what is needed....existing policy is on-target."

Con: "...the ethnic issue--one of the concerns about Eisenhower is that while I understand that there's a reason for addressing underrepresented populations in terms of ethnicity, there's another underrepresented population and that's the population of low-income kids....it seems to me that underrepresentation needs to include not just ethnically underrepresented, but *all* underrepresented groups and, in my view, that includes low-income areas. So I think projects that target schools that...are clearly low-income schools that may not have the large ethnic populations is still a good use of money."

"I think they overemphasize minorities....From my perspective, if they would not target minorities, it would be stronger because you don't have to, you can go with the most excited teacher, the most supportive school, if that's the approach you want to use."

"I think they need to stress minority groups, but train *all* teachers."

"It seemed to me that this year the emphasis was almost 100 percent on the minorities, and if this doesn't involve minorities, forget it! Well, in trying to help teachers, not all teachers belong to minority groups, so I was pretty much left out in the cold."

On the project time frames...

Pro: "In general, I think past years have seen a near-perfect time frame for the projects. That is:

guidelines in summer
submission deadline in October
notification in December
start-up in January
and completion in September of the following year.

This crisp time line is attractive to pre-college teachers as well as to university science faculty who may wish to venture into pre-college science education. *Providing that work toward developing University-LEA partnerships has been an ongoing process,* the existing schedule allows time to:

finalize plans
write the actual proposal
recruit
do some preliminary work in the spring and/or
conduct teacher-training in summer
follow-through for an entire school year, and
do a capstone in the second summer."

Con: "Certainly the one they are using this time stinks....You get funded in January and end-time is the end of September. It's not worth the time that it takes to

write the grant. [In the past] they *had* one and one-half years--so that gave you two summers."

"Multi-year funding is a better way to go. It takes a second or third year of training to get teachers to do what you want."

"If you even look at a grant on a one-year basis without any continuity to it, again, you're going back to that one-shot approach."

"Time frame is too short. I'd rather see a program for three years at the current amount so that we could get something done rather than this."

"The only thing that I can respond to here is that the previous time we were funded, the funding was initiated in October which was late in the school year. It would have been far better if that funding had been initiated say in June, because school starts in September and that would give people a little time to set up. Now this year, the funding initiative will be in January or so? That is ridiculous. One half of the school year is gone, so they should rearrange their start dates."

"I was appalled at the time that [our money] would have to be spent by--what was it? Not even a year? It's like we want long range, and yet...."

On the budget awards...

Pro: "Always, everybody wants more money and they say they can do better on the whole thing. I would say that...most of the funding is around $40,000 on that. I think that is appropriate for what is going on and what is available, and that it actually serves the state of Arizona quite well and that you can get people involved in the different areas and the like. So I would like to see that level stay--the funding level--or that type of understanding continue."

"Dollar amounts are reasonable."

"I'm a scrounger and I'm used to doing a lot with very little, so this was like a windfall."

"The money is generally for seed money--so I don't really have any complaints about the amounts."

"In my opinion, the ABOR annual grants should remain relatively small (under $100,000)."

Con: "If systemic change is a major goal, then fewer grants of more money will probably have greater impact."

"I think if they'd put aside some of that money that they get, and say people who have already gotten proposals funded could submit to get a continuation--that thing of being able to continue the project in at least a limited fashion."

"If we were dependent upon Eisenhower money--for us, it's peanuts--we get nowhere."

On the program evaluation requirements...

Pro: NONE

Con: "It was very difficult to do the evaluation--just trying to find out what to fill out. I think it was more annoying than anything else. That was very unclear. You lose a lot of respect for the people involved at the Board if their documents are not well put together. That's just a recent thing."

"Do they ever do visitations? Do they do an interview?...the evaluation didn't make sense. It had some statements that obviously did not match up with what we were trying to do."

"...and their evaluations! They have this form for the evaluations. If they are going to request specific data on your program on that form, it would be nice if they sent you that form more than 30 days before they want it back because you can't collect the data after the fact. They wanted a lot of breakdowns on the number of minority students that teachers have. No teacher--they don't have these numbers on their kids. I understand where they're coming from, and I understand we need to pay attention to it, but it does nothing in terms of whether it is a good program. It takes a tone of --'time to break the information out that way.' And it's not telling them a thing. It's giving them number that they can pass on to Washington, because they're also tracking numbers of minorities. Tracking numbers doesn't male it a good program. And it's time-consuming. I don't think it tells them what they need to know except, well, the 'bean counters' who are tracking that way. The question isn't, I understand you want to know how many participants you have, but that's not really the important question."

▶ The grant application review process

In no other area was there the high degree of consensus regarding the absolute need to revise the process by which grants are evaluated. Although there were some who felt that "the process of review was a fairly standard type of process" and that "the criteria for evaluation, format, the timing--those things are not so bad," the overwhelming majority of respondents expressed dissatisfaction with the review process. Criticism was primarily leveled against the fact that guidelines and criteria for preparing proposals are not aligned with guidelines for evaluating them--in fact, few people are aware of the guidelines used to evaluate proposals.

"I don't know what their criteria are, but sometimes I've been amazed at some of the things that were awarded."

"Any wide range of guidelines would be suitable to the sort of project I see as suitable for ABOR. The only stipulation, and I feel an imperative, is that there is a one-to-one match between published guidelines and selection criteria employed by the panel. In the past, there have been [serious] discrepancies in this area."

"And I think that needs to be changed in terms of: Are there long-range plans?, and Is this one-year grant part of a bigger long-range plan? So I think part of the evaluation criteria would be that even though someone may be applying for a grant for that particularly year, that if there are long-range plans, it should be given a higher priority than someone who just wants to go in and do a one-shot deal. So I think criteria do need to be changed a bit."

"Guidelines needs to be clarified--they bounce around....I think that there are hidden criteria that are not published that are leaning to specific people who know they are getting grants, and not to people who have good projects not knowing that these are the criteria. I think that's true this year. I didn't bother to apply once I found out all the criteria that were unwritten--three people told me that."

"[ABOR] needs to make sure the wording of the evaluation is clear. This is the most important improvement that could be made. I would like a clearer idea of what they are looking for.."

"I know several people in this department are not very happy with the policies because they've tried in the past, and with the way things are done....Some people here told me not to even bother because mostly certain people at [another university] get funded."

"I was *real* unhappy with [previous grant competitions] because, I mean, I've done an Eisenhower program in [another state] before coming here, and I had the sense...here that it was an inside arrangement--that there were criteria being used to judge proposals that were not widely known to those writing the proposals."

A second area of dissatisfaction centered on the composition of the review panel.

"[A good review process is] out-of-house [i.e., outside of ABOR]. I don't know what process they used last year, but I think whoever's directing Eisenhower needs to draw on a relatively independent group of people from around the state to review the projects. So that's one thing. And, I would limit the director's discretion. I don't know how much its used, but I think it should be clear as to how much discretion can be exercised in-house. And then, it should be clear as to what kind of review panel has been assembled for looking at the projects."

"You need a grouping of diverse areas...which means that in RFPs, it might say these proposals are going to be evaluated by a team of this make-up: university content specialist, community college people, teachers, or whatever you get from them. Make that type of information available to the person writing so you have some idea of the type of information you might add."

"Great care should be taken as to who is picked to evaluate the grants because, having watched this over a number of years, the type of grant funded is based on the type of people evaluating. If you are going to do teacher-training, then I think the people on the committee should be comprised of people who are master teachers from the high school districts along with the people in math ed or science ed at the university level--not necessarily straight education."

"There should be some sort of standard make-up of the committee. And people who are interested....If you're going to be talking about high school people, you can't just put university people on it. "

"What the Board should do is set up general policy guidelines. They should not be involved in the process at all. They should put together a committee and give it the proper guidelines as to what the money should be used for. The committee should be in charge of dissemination and enforcing the evaluation requirements. That would be a proper role for the Board. The Board should advise the committee as to the guidelines. What I hear is that the Board keeps changing from year-to-year. The guidelines from one year are different the next year. It seems to me like the money is just up for grabs and whomever sits on the Board that year determines what the guidelines are."

"If it's going to be a partnership, then the committee should include members from the partners, They should be people who know something about science and math."

"...to me, obviously the key thing in any kind of grant activity is first of all, to attract good proposals, and secondly, to evaluate them intelligently and fairly and with a view to what is going to happen in the future and whether this is really going to have an effect somehow. My feeling is that it is still true that the evaluations are done as a very hit-or-miss process....All of a sudden, somebody at the institution is asked to send somebody up to Phoenix to do this evaluation for us. The provost asks the deans; the deans think of whomever they can who might be able to do this in their area; this names goes in; then you are called from Phoenix and asked if you'll do this. A whole bunch of materials are sent down, then you're asked to come on a day which they probably can't come on and so on. As far as I can tell, this is still going on to some extent.."

"I'm not sure how they get the people together to read the proposals and, like, grade them. But I think sometimes that's kind of arbitrary....So I think that they need to make sure when they're putting together a group of readers, or whatever, that they need to get a good cross-section, a good representation, in order to give everybody a fair shot."

At least two respondents, from different institutions, expressed the notion that there needs to be an external agency monitoring the review process:

"Another area that I think is real critical is that they [ABOR] set aside money in there to hire [somebody] to be the watchdog of the evaluation."

"Whenever you've got big money, and this is big money, then there's entanglements. Somebody needs to be a watchdog, I guess."

Several respondents felt that reviewers should be from out-of state:

> "It wouldn't be much more expensive to bring somebody in from Utah or California or New Mexico than it is to bring people into Phoenix from around the state. I think that makes a lot more sense. If, in fact, they were going to do that, then they ought to advertise the fact they are going to do that before thy ask for proposals, so people think they are submitting proposals will have a feeling that they're going to get a better evaluation procedure than they've had in the past....You don't want friends of submitters to be evaluating proposals. What we have here is a situation [where] most of us who are likely to submit proposals in math/science education know each other....But clearly, if you get just a bit more distance, not just in terms of geographic distance, but in terms of not knowing well the people who are submitting these things, I think that would help."

> "Selection of specific projects for funding should be made by knowledgeable yet disinterested persons, including teachers and science professionals, possibly from adjacent states, who are familiar with problems of local minorities as well as with education at all levels, primary to university."

However, one person explicitly rejected this notion stating: "...the further you get from the state, the further you get away from the needs of the area."

► **The overall administration of the IHE Eisenhower program**

In the content of the overall administration of the IHE Eisenhower program, by far the biggest topic of conversation concerned the lack of continuity due to annual changes in personnel.

> "[There have been] problems with the program managers at ABOR. Verbal contacts elicit varying answers over time. What is wanted should be written."

> "I don't think the program has been well run...I think all of the people the last few years--we've had these visiting on-loan people from the universities--this is an excellent idea, but it hasn't given us the continuity that we had before. [ABOR] needs to get somebody into the position...who will put time and energy into this."

> "It might help...to go to having someone at ABOR to overseeing this, as opposed to changing the person every year. That gets a little nuts from this end of it. But I believe they are moving in that direction. It does not help in terms of people knowing what's going on. The interpretations of the directors differs from year-to-year. You need consistency."

Other areas of concern had to do with the need for technical assistance provided by ABOR regarding the grants.

> "One of the greatest faults I find with the program [is] that if there is somebody out there who would really like to be involved and they have what would seem a good idea to them, then they ought to have an opportunity to--say--test it out. And if ABOR is open to bringing in new people, then perhaps there are resources that they could lend out to

> these people...maybe a resource that might go to the Colorado River Valley and work up there for three days with two or three different groups. Then in a month, they might come back and go over it, and then in another month they might come back again--they don't have to stay with them all the time. They could do that out over the state to really help the ones who want it and want to apply and cannot for the reasons I've mentioned [e.g., not professionally trained; do not have resources]."
>
> "[One year] they had a telephone networking to answer questions about successful grant writing--I found it very useful, most of it. I thought it was very well done."
>
> "I would strongly encourage the feedback [on proposals]. You know, we got *no* feedback on the proposals that were rejected. Well, we did get some on the second, but it wasn't helpful, let's put it that way. It really gave you the feeling that you hadn't hit the agenda--not that you knew what the agenda was up front."

Very few people commented specifically on "bigger picture" policy issues, but of those that did, the following are representative of their concerns:

> "It's not an [issue of] 'improve Eisenhower.' Eisenhower money comes from the Federal government and then it's doled out here--like here's a jelly bean, here's another jelly bean--the whole thing is dumb. They have these little caps where you can't get more than this and that. The whole idea is to spread the jelly beans around the sate. That's baloney. If ABOR wants to do something, they should get serious. They should set up a task force and see how the colleges and community colleges can work with the high schools in a systematic way to increase and improve the curriculum. The argument I make is for systemic improvement, for radical improvement in curriculum. Tweaking a pork barrel--like Eisenhower, minor pork barrel, and sending it out to the field is not going to do anything one way or the other. It's not bad, but it's not going to solve any problems."
>
> "As far as the criteria are concerned, I think the regents have not only the responsibility, but the obligation, to set criteria. They ought to do that....But if the Regents can't set policy, then there's no point in having the Regents."
>
> "They need to take a more political role. They need to push the legislature to get the money necessary to make Arizona's educational system some of the best in the U.S., otherwise we can forget it. So I think the policies that would help our programs are those that would first articulate K-16 systems, encourage that articulation--that is, elementary school faculty working with graduate faculty and all the other possible permutations between; secondarily, really push for increased spending in education with a coherent plan and a coherent justification for why that money is necessary; and the third area is to really take a look at the real needs in Arizona, particularly for minority students and minority teachers and provide a general enhancement program that gets them in tune with macro and micro translations."

IV. THE ARIZONA STATE SYSTEMIC INITIATIVE

Finally, respondents were asked if they were aware of the proposed Arizona State Systemic Initiative (SSI) and, if so, to comment on how IHE Eisenhower grants might be able to strengthen math-science education in grades K-12 within this context. One-fifth of the respondents (21 percent) stated a lack of familiarity with Arizona's proposal. Other interviewees who were familiar with the state systemic initiative were unclear about the status of the proposal. Many of these indicated the absence of a clear understanding as to what activities were proposed, based on different drafts of the proposal each had read.

Of those who responded to this question, many felt that IHE funds had potential to support Arizona SSI-endorsed training centers or other activities. Suggestions for the use of IHE Eisenhower funds in the context of systemic reform include using the monies to:

- provide schools with an opportunity to personalize teacher-training; make it unique to the local school districts
- "fill in the gaps" of teaching strategies implemented through the SSI
- make university training available at a local site
- reinforce or strengthen what is already being done
- train teachers in assessment, other than paper and pencil tests

Still other suggestions indicated a lack of familiarity of the intent of IHE Eisenhower monies (i.e., for teacher preparation/enhancement), as in suggesting that funds be used to purchase materials for schools, develop curriculum or develop other resources (e.g., electronic networks; mobile resource units).

Among the interviewees, there were those who expressed strong reservation about Arizona's SSI. One respondent felt that a weakness in the proposal was that it had to be channeled through the Governor's office:

> "It just becomes another political football. It just becomes another Christmas tree--everybody puts their little ornament on it."

Several respondents expressed specific concerns over the administration of the SSI by the Arizona Department of Education. One saw the SSI as a means by which ADE would "gain total control" over *all* Eisenhower funds, which would be "disastrous." In a similar vein, one person felt that "the existing [IHE] Eisenhower process must remain distanced from any state-level reform effort."

More frequently, concerns were expressed about systemic initiatives becoming just another "layer of bureaucracy" as reflected in the following comments:

> "When I started reading the proposal, it was like a nightmare of layers. We'd have to go through more and more and more steps. I am just hoping it doesn't become more of a bureaucratic set of obstacles."

> "Now you have this weird sort of situation where you have possible competition, still more possible dispersions of money. You've created another level of bureaucracy. You've diluted the effect. You have no real systematic way to study all of the impacts."

The tone that came through the interviews was that everyone familiar with the *Arizona State Systemic Initiative Proposal* saw good intentions, and felt that the monetary award would be beneficial for Arizona. Many felt that IHE Eisenhower monies could be used effectively in concert with the state reform initiatives. However, most expressed the desire for the IHE program to remain administratively autonomous from the SSI, given real concerns about the practical operation of the plan, if funded by the National Science Foundation.

APPENDIX D

K-12 Teacher-Trainee Survey Responses

In fall 1992, the Arizona Board of Regents provided Morrison Institute with 16 project descriptions identified as active IHE Eisenhower programs. Institute analysts, working with these project's directors, identified LEA program participants to take part in a brief, informal survey (administered by mail, fax, and telephone). A total of 46 participants were identified; 23 responded for a response rate of 50 percent. All but one of the respondents were first-time Eisenhower participants. Respondents represented 10 out of 16 projects and five of six state institutions of higher education receiving grants (i.e., three universities and two community colleges).

The purpose of the survey was to investigate K-12 teachers' satisfaction with their participation in Eisenhower programs. In Part I of the survey, respondents were asked to rate six elements of program quality as defined by the Federal Register, as well as to rate their program with respect to minority recruitment, business/industry partnerships, and emphasis on elementary and middle school teachers. For questions in Part I, teachers were asked to rate each item using a 4-point scale from "strongly agree" to "strongly disagree." In Part II of the survey, teachers were asked to respond to two open-ended questions regarding the programs in which they were involved. Responses to Part I are shown in Table D-1.

Table D-1: K-12 Teacher Ratings of IHE Eisenhower Programs (N = 23)

Item	Response					Average	Rank
	SA (1)	A (2)	D (3)	SD (4)	NR		
Q1: Participants in the program were recruited from historically underrepresented and underserved groups.	15	5	–	2	1	1.50	3
Q2: The program had an active partnership with business and/or industry.	7	5	3	1	7	1.88	9
Q3: The program served primarily elementary and middle schools.	14	2	3	3	1	1.77	7
Q4: The program was related to my school's long-term improvement goals for math-science education.	14	5	1	2	1	1.59	5
Q5: Training activities were sufficiently intense to allow for integration into understanding and implementation.	16	4	1	1	1	1.41	2
Q6: Training activities were related to classroom assignments.	13	6	–	2	2	1.57	4
Q7: Training activities included professional teams (rather than individuals).	9	8	2	2	2	1.86	8
Q8: The program provided follow-up or reinforcement activities or both.	10	9	2	1	1	1.73	6
Q9: The project had the administrative and policy support of my school.	18	2	–	2	1	1.36	1

The results shown in Table D-1 indicate that teacher-trainees agree, on the whole, that Arizona's IHE programs *are* meeting the intent of regulations governing these programs. Relatively speaking, teachers most agreed that programs had administrative support and that training activities were sufficiently intense to allow for integration into understanding and implementation. They least agreed with the fact that there was an active partnership with business and/or industry and that training activities included teams.

In Part II, teachers were asked: "Do you think this project has really contributed to a change in the way math-science is taught in Arizona? How do you think it has or has not changed?" Sixteen teachers (69.5 percent) felt that the program in which they were involved *had* contributed to a change in the way math-science is taught. A majority of responses noted changes in pedagogy--moving away from textbook learning to "hands-on" learning. The following comments are representative of responses in this area.

> "Yes it has made an impact. Science education is this state and in the U.S. is still product-oriented rather than process-oriented. This program has made a small dent in this fallacy of instructional methodology."
>
> "Yes. The implementation of [this program] in our middle school and ninth grade has emphasized the component of application in math and science. The use of people in business and from universities reinforced the application of math and science."
>
> "Yes--promotes 'hands-on' and higher order thinking; problem-solving skills."
>
> "This project has definitely had an impact on the way math/science is taught [here]. In the past, math/science has been a book-oriented subject. [This program] changed that. Teachers who have never done so before are venturing out from between the protection of the two covers and four walls and actually doing science--not just reading about it."

Several teachers specifically cited positive benefits for students.

> "Students are eager to do math; added self-confidence."
>
> "My students love math and are truly competent in the skills I have taught. This was a great program!! ...Also my students did a [math workshop] for a fifth grade class from [another school]. The students were successful and very proud of their ability to teach math to other students. This was a great positive reinforcement for them and boosted their self-esteem."
>
> "This program made science and math more meaningful to the teachers and the students. ...Children learn best when they like what they are doing!"
>
> "My students have been extremely excited and motivated about the [topics] that I have been able to share with them."

Finally, several teachers commented specifically on personal gains in their own content knowledge.

> "I am a better teacher because of [this program]."

"My personal experience has enhanced my math skills--making me a better teacher."

"It has made a major change in my situation, allowing me the experience necessary to move away from some of the lab exercises found in textbooks toward a more up-to-date use of technology in the classroom."

"I thoroughly enjoyed it. It gave me insights into presenting information...even at a kindergarten level."

Of the seven remaining respondents, they: a) said the program had *not* made a difference; b) were unsure; or c) did not answer the question directly.

No difference: "I don't see much of a change--not a real big change."

Unsure: "Not sure. It seems to me that those who participate are those who are working to change math-science anyway."

"It's hard to say whether this program is helping to change the way we teach because we tend to be isolated from each other. It has all the makings to change our programs, but it is up to the districts to implement it."

Other: "I haven't been in it long enough. I'm not in a classroom environment."

"The ideas sound good. Some change in thinking of older programs must be made. Merely throwing money out to be used is not the answer."

"Have to start small to make change."

Lastly, teachers were invited to write any additional comments about their program or math-science education in general. Of those who added comments, they focused on things such as:

- the quality of program staff (e.g., "Great teacher/facilitators! They were good coaches and good models for the scientific process. I hope to be able to work with them again.)
- the quality of the program in general (e.g., "Really great program.")
- the need for continued dialogue/change
- the benefits of networking/sharing
- the need for better coordination among elementary, secondary, and higher education

One teacher offered the following:

"The training that I have received from these programs has been both excellent and necessary. Many teachers do not have the opportunity to attend university classes except during the summer and with the money crunch, many universities are not offering summer classes in Science. Also these classes are specifically geared to bring research and current technology into the classroom."

APPENDIX E

Commentary by External Proposal Reviewers

For the most recent IHE Eisenhower grant competition (i.e., FY 1992-93 allocations), the Arizona Board of Regents--for the first time--utilized a panel of five math-science experts from out-of-state. These reviewers met in December of 1992. In January 1993, Morrison Institute's project director for this study met with three of the five reviewers, all of whom are affiliated with IHE Eisenhower programs in Texas. All three persons interviewed were in agreement about several aspects of Arizona's grant competition and proposals which they felt could be improved upon. The following discussion summarizes their perceptions. External reviewers offered commentary on two aspects of the grant competition: 1) the board's administration of the grant competition and 2) the quality of proposals submitted.

► Arizona's administration of the IHE Eisenhower grant competition

Regarding the board's administration of the IHE Eisenhower grant competition, reviewers noted that:

- Arizona guidelines for preparing proposals were unclear
- the RFP did not require strong evidence of program "accountability"
- no technical assistance was provided in helping potential proposal writers
- the funding cycle (i.e., January - September) seemed too short, and should be reconsidered

Reviewers cited their own experiences with their state's administration of the Eisenhower program. They felt that their state, in comparison with Arizona, offered strong, consistent state-level administration, focused RFPs, technical assistance from the state in terms of a state Eisenhower conference and workshops for potential grantees, and a strong funding cycle (i.e., 15-month projects). They also noted requirements for IHE Eisenhower programs in their state that are lacking in Arizona. These include requirements that specify:

- *teams* of math-science specialists and teacher educators at the IHE level
- IHE and LEA co-coordinators/project directors
- a plan for disseminating the results of the program
- attendance at the state's Eisenhower conference
- LEA commitment in terms of matching funds

► The quality of proposals

In critiquing the proposals submitted, reviewers commented on both general and specific aspects of the proposals.

General comments on Arizona proposals

General comments, reflecting an assessment of the majority of proposals, focused on several elements. Reviewers noted the prevalence of "non-specific language" used in writing project descriptions. Language was described as "vague." Reviewers felt that proposal writers "left much up to inference/assumption."

Reviewers also felt that Arizona proposal writers made poor use of appendices. Reviewers noted that appendices provide proposal writers the opportunity to attach syllabi, materials, and a variety of other supporting documents that help convey the importance and significance of the proposed project. They noted the general lack of appendix material that would help a reviewer assess the possible impact of the program.

Proposals were described as "off-track" in relation to the intent of Eisenhower grants (i.e., to upgrade teachers' content knowledge). Reviewers cited projects trying to "reinvent the wheel"--specifically, curriculum development projects. They noted that IHE Eisenhower monies, by federal definition, are not intended primarily to produce materials but rather to train teachers. Additionally, they noted that sufficient curriculum products are available nationally, calling into question the need to fund state curriculum development efforts with Eisenhower funds.

Finally, reviewers felt that there was insufficient evidence of district (i.e., LEA) commitment to proposed projects. Beyond a "letter of support," reviewers wanted to see evidence of the LEA's commitment to the proposed project by matching funds or evidence of a plan to continue/institutionalize training. They note that in several states, including Texas, districts are *required* to match IHE Eisenhower funds with their local LEA Eisenhower dollars. They feel that this type of requirement reinforces the need and importance of the training for all participants.

Comments on specific aspects of Arizona proposals

In commenting on specific sections of project proposals, reviewers made comments in six areas: 1) the project rationale/justification, 2) instructional plans (i.e., project description), 3) project management plans, 4) budgets, 5) evaluation designs, and 6) dissemination plans. Each of these areas are elaborated upon in the sections that follow.

Project rationale/justification: Reviewers noted that too many proposals did not relate their proposed training to a documented need for the training, i.e., there was no evidence of a local needs assessment. Part of the problem appeared to be a lack of *clear* coordination between the IHE and LEA. Some proposals were viewed as "university-driven" and "out-of-touch with reality".

Instructional plans: Reviewers felt that many proposals did not adequately explain *how* training would be delivered in terms of a scope and sequence for instruction. They felt that time frames were lacking and that little evidence of instruction was submitted (e.g., a syllabus; description of a sample day). Additionally, reviewers felt that there was not enough evidence that the content of the proposed training was research-based.

Management plans: In several cases, reviewers felt that there was a lack of "big name" credentials of the proposed project managers. They noted that Arizona has nationally-recognized math and science experts who might be recruited for participation in projects. They also commented on the lack of articulation between universities and LEAs in sharing project management responsibilities and felt that management plans should more clearly address the prior experience of managers *in the schools*.

Project budgets: Overall, budgets were described as "weak." Budget justifications were perceived as inadequate due, primarily, to a lack of alignment between budget requests with proposed training. Additionally, reviewers felt that there was not enough evidence of "matching funds" by LEAs to demonstrate the LEA commitment to the project. Finally, reviewers felt that too much money was allocated to administrative costs and consultants.

Evaluation designs: Evaluation designs were criticized for *not* focusing on assessing the purpose of most programs, i.e., to upgrade the content knowledge of teachers. Reviewers felt that few proposals addressed how they would assess or measure an increase in teachers' content knowledge. Rather, evaluations focused on other aspects of training. One example cited was that of a project proposing to videotape teachers without specifying or describing how tapes would be analyzed to see if content knowledge was incorporated. Apart from this "flaw," reviewers also felt that videotapes are a disruptive and artificial means of measurement.

Dissemination plans: Finally, reviewers felt that dissemination plans were weak. They noted that project dissemination is a requirement in their state and cited examples of state expectations for dissemination: to present at a professional conference; to provide training to other districts; to write an article for either a refereed or non-refereed journal; or to advertise in some fashion what the project is doing or has done.

In closing, reviewers provided the following suggestions/recommendations for Arizona:

- Strengthen the state-level administration of the Eisenhower program.
- Change the nine-month funding cycle.
- Model RFPs/guidelines after other successful practices (e.g., Texas).
- Train proposal reviewers.
- Create a checklist for the RFP and review process.
- Institute stronger evaluation at the state level.

APPENDIX F

Administering IHE Eisenhower Programs--Perspectives from Other States

Between September 1992 and April 1993, Morrison Institute analysts surveyed all western states (with the exception of Alaska and Hawaii) regarding their administration of IHE Eisenhower programs. State-level administrators for the IHE Eisenhower program in 21 states were identified and contacted by telephone on one or more occasions in order to gather consistent and uniform information. (Twenty surveys were conducted by telephone and one was initially conducted by letter with a follow-up by telephone.)

Questions were divided into three categories: administration of the RFP, program evaluation, and "other." Questions under administration of the RFP dealt with 1) an activities time line for the preparation and submission of the RFP and 2) the process by which the RFPs were evaluated and selected. The program evaluation component gathered information on RFP requirements for local project evaluation as well as state-level evaluation efforts. The "other" category consisted of an open-ended question to elicit important or unique aspects about programs that may not have been discussed in responding to earlier questions.

Information has been summarized in Tables F-1 through F-4. Tables are followed by brief profiles of each state which clarify information presented in the tables, and highlight other unique aspects of the IHE Eisenhower administration of the state. Some information presented may not reflect what is currently operational for all programs, as some states have new administrators in place and other states are in the process of evaluating and enhancing their past processes.

Throughout Tables F-1 through F-4, state names appearing in ***bold italic*** type are members of the Western Interstate Commission for Higher Education (WICHE).

In sum, this appendix summarizes some of the key aspects of administering higher education Eisenhower programs in other states.

► **Table F-1 summarizes information about IHE Eisenhower program funds.**

Table F-1 shows a range of dollars awarded per program from a low of $600 to a high of $300,000. Two states award over $200,000 to at least one program. There are two states whose average is $14,000 and under, 3 states fall into the $20,000 to $25,000 range, four states range from $21,000 to $30,000, six states are in the range of $31,000 to $40,000, and three states fall into the "over $50,000" category. One state did not report an average dollar amount awarded. The range of state level appropriations is from $296,800 (Idaho, Montana, North Dakota, South Dakota, and Wyoming) to a high of $6,029,421 (California).

► **Table F-2 depicts state support services provided by SAHEs to IHE Eisenhower grantees.**

Table F-2 indicates that 12 states said they provided some type of support service to IHE grantees, while nine said they did not provide any support. Technical assistance was the most frequently mentioned type of support (7), pre-proposal workshops were second (6), followed by planning meetings (3), and "other" (1).

► **Table F-3 shows whether states use in-state or out-of-state reviewers for their grant competitions, as well as the composition of review panels.**

Table F-3 reveals that 14 states use exclusively in-state people, while six states use exclusively out-of-state people to evaluate proposals. By frequency of occurrence, members of evaluation committees most often include representatives of institutions of higher education (19), K-12 education (11), government agencies (6), state education agencies (5), business and industry representatives (4), and consultants (2).

► **Table F-4 highlights procedures pertinent to the state evaluation of IHE Eisenhower programs.**

Specifically, the chart illustrates the nature of state site visits. In response to the question of site visits, 17 states replied that they *did* conduct some type of site visit, while four said they conducted no site visits. When site visits were conducted, 10 states visited *all* funded programs, 3 visited all *new* programs, one state visited one-third and one state visited one-fourth of all programs. Information on the number of programs visited was not available for two states that conducted site visits.

Table F-1. Western State IHE Eisenhower Funding

STATE (1992 Appropriation)	AVERAGE DOLLAR AMOUNT OF AWARD	AVERAGE LENGTH OF PROGRAM[a]	RFP CATEGORIES/ EAR-MARKED FUNDS?
Arizona ($739,088)	$48,000	16 months	No
Arkansas ($638,620)	$20,000	15-20 days	Conference All math or all science Combination math/science
California ($6,029,421)	$225,000	200 hours	No
Colorado ($612,866)	3 levels of funding: $11,000, $60,000 and $60,000	1-2 years, mostly 3 years	3 categories: pilot or prototype, 3 year funding, one year projects.
Idaho ($296,800)	$14,000	2 college credit equivalent	No
Iowa ($557,249)	$30,000 - 50,000	3 days to 3 weeks	No
Kansas ($482,970)	$40,000	1 year	Same RFP issued twice - split year's funding.
Louisiana ($1,263,642)	$30,000 - 45,000	1 year	No
Minnesota ($847,303)	$30,000	2 weeks	Two categories: teacher training and underserved populations.
Missouri ($1,083,962)	$30,000 - 40,000	Unknown - varies greatly	No
Montana ($296,800)	$18,500	Unknown	No
Nebraska ($323,211)	$30,000	3-4 weeks	Three categories: conference, cooperative (partnership development), and traditional workshops.
Nevada ($296,800)	$20,000 - 25,000	3 weeks	No
New Mexico ($411,282)	$42,300	3 weeks	Two categories: summer in-service and other math/science.
North Dakota ($296,800)	$15,000- 20,000	3-4 days (40 activity hours)	No
Oklahoma ($665,195)	$50,000 - $60,000	1 year (activities run 3-6 weeks or year around)	No

[a] Program lengths vary by state based on how each state interpreted the question. Some states provided the exact number of hours or days that workshops or follow-up activities were held. Others responded giving the length of the funding cycle.

Table F-1--*continued*

STATE	AVERAGE DOLLAR AMOUNT OF AWARD	AVERAGE LENGTH OF PROGRAM	RFP CATEGORIES/EAR-MARKED FUNDS?
Oregon ($553,885)	$35,000	15 months	Two categories: regular programs and special needs.
South Dakota ($296,800)	$25,000	18 months (1 week plus follow-up)	Two categories: teacher training and SSI focused conferences.
Texas ($4,003,119)	$35,000	3 weeks	Two categories: summer programs and regular programs.
Utah ($385,957)	$40,000	15 days during a year	No
Washington ($866,949)	$35,000	2.5 - 3 weeks	No
Wyoming ($296,800)	$600 - 300,0000	1 year	No

Table F-2. Western State IHE Eisenhower Support Services

STATE	Do you provide support services to IHE grantees?		Kinds of Support Services Offered			
	YES	NO	Technical Assistance	Planning Meetings	Pre-proposal workshops	Other
Arizona		✓				
Arkansas	✓				✓	
California	✓		✓			
Colorado	✓		✓		✓	
Idaho	✓		✓	✓		✓
Iowa	✓				✓	
Kansas		✓				
Louisiana		✓				
Minnesota		✓				
Missouri	✓				✓	
Montana	✓		✓			
Nebraska	✓		✓			
Nevada		✓				
New Mexico	✓			✓		
North Dakota		✓				
Oklahoma		✓				
Oregon		✓				
South Dakota		✓				
Texas	✓		✓		✓	
Utah	✓			✓	✓	
Washington		✓				
Wyoming	✓		✓			

Table F-3. Western State Proposal Evaluation Committees

STATE	In-state?	EVALUATION COMMITTEE COMPOSITION						
		Bus/ Ind	Consultant	Govt Agency	IHE	K-12	SAE	Other features of selection committee
Arizona	Yes/ No[a]				✓			
Arkansas	Yes	✓			✓	✓	✓	
California	Yes	✓	✓	✓	✓	✓	✓	Peer review; Rural & minority representation
Colorado	Yes	✓		✓		✓		Rural & minority representation
Idaho	No		✓		✓		✓	
Iowa	Yes				✓	✓	✓	
Kansas	Yes				✓			
Louisiana	No				✓			
Minnesota	Yes				✓	✓		
Missouri	Not formalized by new state administrator at time of interview. State has used both in and out-of-state committees in past. Would like to use both in the future, perhaps including other state administrators.							
Montana	Yes			✓	✓	✓		
Nebraska[b]	Yes				✓	✓		
Nevada	Yes				✓	✓		
New Mexico	Yes			✓	✓			
North Dakota	No				✓			
Oklahoma	Yes				✓	✓		
Oregon	Yes			✓	✓	✓		Minority representation
South Dakota	No				✓			
Texas	No				✓			
Utah	No				✓		✓	
Washington	Yes	✓		✓	✓			Peer review
Wyoming	Yes				✓	✓		

[a] Prior to 1992-93, Arizona used in-state committees. An out-of-state committee was assembled for the latest review cycle.
[b] Composition of evaluation committee is weighted to practicing teachers.

Table F-4. State-Level Evaluation Activities

STATE	Site Visits?	# Programs Visited	Nature of Site Visits
Arizona	No	N/A	
Arkansas	Yes	All programs	Done last year but not this year. Excellent PR tool/goodwill gesture; Provide feedback if appropriate.
California	Yes	All programs	State evaluation team visits each project at least once. Evaluation based on same criteria for all projects.
Colorado	Yes	33% of program/yr (3-yr funding cycle: all visited in cycle.)	Site visits plus "video" site visits for 1/3 of projects each year.
Idaho	Yes	All new programs	Done on a random basis. Try to visit all new projects.
Iowa	Yes	All programs	Try to visit each program every year to see what is going on. Informational in nature.
Kansas	No	N/A	
Louisiana	Yes	All programs	Use a consultant to visit all funded projects.
Minnesota	No	N/A	
Missouri	Yes	All programs	Expect to visit each program. Will provide written feedback on strengths and areas for improvement.
Montana	Yes	Information not available	Done if in area when program is in session. Visit is informational in nature.
Nebraska	Yes	All programs	The nature of the visit is to monitor what is going on.
Nevada	Yes	Information not available	Conduct as many as feasible. Contact a lot by phone.
New Mexico	No	N/A	
North Dakota	Yes	All programs	Use people from community colleges to evaluate projects during activity phase.
Oklahoma	Yes	Evaluate all programs; randomly visit for liaison purposes.	New this year: will hire K-12 teachers to evaluate each program. Random site visits to provide liaison function.
Oregon	No	N/A	[NOTE: Outcome of site visits was determined to be of no value. Put the money into program funding.]
South Dakota	Yes	All new programs	First priority is all new programs or new program directors, then other programs.
Texas	Yes	25% of programs	Done as overview to determine if any problems exist.
Utah	Yes	All programs	Visit each project once to determine compliance.
Washington	Yes	All new programs	Done on a random basis for quality control, unless program appear "marginal." Visit all new programs.
Wyoming	Yes	All programs	Monitoring nature; no formal evaluation is done.

STATE PROFILES

▶ **Arkansas**

Suzanne Mitchell
Program Director
Department of Higher Education

There are three RFP categories: math and/or science programs, programs addressing specific state goals, and sponsorship of an annual statewide "Math-Science Leadership Conference." Funding for the "Math-Science Leadership Conference" is a combination of Eisenhower monies (both IHE and SAE) and monies from state teachers' groups and similar organizations. People involved in all facets of math/science education from across the state attend.

All in-state people comprise the RFP selection committee. The members include one science and one math "Presidential Award" recipient, college faculty, business people, and a representative from the SAE.

Site visits to programs are conducted by the IHE Eisenhower administrator. All programs were visited last year but she has been unable to do site visits this year. These visits are a "goodwill gesture." The IHE Eisenhower coordinator sits in one programs and gives feedback when appropriate. The IHE Eisenhower coordinator conducts no formal, state level evaluation of IHE Eisenhower programs.

The average dollar amount awarded per program is about $20,000. The programs run the equivalent of 15 to 20 days. Arkansas held their first statewide workshop last year for reviewing the RFP and answering questions.

▶ **California**

Linda White
Senior Policy Analyst/Administrator Eisenhower Program
California Postsecondary Education Commission

The proposal process consists of two steps. The first step is a five to ten page outline describing what the proposers want to do, why, and how. A budget is not required. One to two weeks before the due date, the administrative staff holds technical sessions around the state to help draft these documents. Finalists are selected through a review of the preliminary documents. This group will attend an interview session where questions will be answered. Program directors and co-directors are required to attend. After this meeting, the finalists have two months to complete and submit their full proposal. All finalists receive some level of funding. The average dollar amount of awards is $225,000 with an average program length of 200 hours. The state does not have more than one RFP category or earmark funds to meet specific priorities.

Evaluation of proposals is done by a committee comprised of a cross-section of interests, genders, professions, and ethnic groups. The committee members are drawn from a pool. This pool is formed though a continual stream of recommendations from state colleges and universities, the community colleges, K-12 institutions, various organizations, individuals, previous and current panel members.

Self-evaluation of programs is no longer done for state purposes. A new state evaluation process is beginning in which a team of seven people will determine the evaluation criteria used for all projects. The state team will form conduct site-based evaluation visits. Teams consisting of two state evaluation team

members, one project director and one postsecondary staff person will visit each project at least once per year.

▶ **Colorado** Sharon Sampson
Academic Officer
Commission on Higher Education

The RFP is a two-stage process. Stage one requires the submission of written responses to a series of seven questions defining the problem and proposing a solution. From these submissions a group of finalists is selected who will then develop and submit full proposals. The evaluation committee places each finalist in one funding group those under $20,000 that are pilot projects or prototypes, three years funding for those programs which show strong outcomes achieved over time (average $60,000), and one-year programs (average $60,000). Technical assistance meetings are held in three different locations around the state following distribution of the RFP.

The evaluation of the RFPs is a "consumer-driven" process conducted by a committee composed of K-12 people: one elementary school teacher, one middle school teacher, one representative of a minority organization, one business/industry representative, and a representative from the governor's office or an SSI representative. Higher education input is at the planning committee level (all members are higher education people).

Site visits are currently conducted for about one-third of all of the programs. Staff plan to include video site visits (15 - 20 minutes of tape) plus a follow-up phone call to supplement physical site visits. Since most programs are funded for three years, staff can "visit" each program at least once.

▶ **Idaho** Tom Farley
Mathematics Supervisor
Department of Education

The RFP is generated at an annual meeting held in Boise. Two to three representatives from each IHE in the state plus all other potential proposers are invited to attend. Problems and evaluation results from the previous year are discussed. Evaluation of the RFPs is done by a committee consisting of out-of-state experts. These experts include consultants, professors, retired math supervisor, science experts, etc.

The average program length is at least one semester (two weeks training plus follow-up). The average dollar amount awarded is $14,000 (range of $5,000 to $35,000). There are no RFP categories or earmarked funds. Site visits are done randomly with all new sites receiving top priority.

▶ **Iowa** Dan Via
Research Analyst
Iowa Board of Regents

The RFP is reviewed by an advisory committee that also serves as the evaluation committee. The committee is composed of all in-state people from each educational sector: community colleges, all universities, private and/or independent institutions, the State Department of Education, one school supervisor, and two K-12 teachers. The state wanted the committee to represent a balance of interests.

One informational meeting is held each year in Des Moines. Notification for this one-half day informal meeting is contained in the RFP.

Site visits of an information nature are planned to each project. The purpose of these visits is to observe and participate in activities. The dollars awarded per program range from $30,000 to $50,000 with an actual program length of three days to three weeks (excluding follow-up). There are no RFP categories or earmarked funds.

▶ **Kansas**

John Welsh
Associate Director of Academic Affairs
Kansas Board of Regents

An advisory committee reviews the draft of the RFP before its biannual distribution. One half the funds are awarded in the fall and one-half in the spring. The same RFP is issued each time.

In the past they held a grant writing session that was very successful. Since they no longer have control over the administrative portion of the IHE Eisenhower funds they cannot offer workshops or technical sessions.

The evaluation of the RFPs is done by the advisory committee. This is an all in-state committee composed of two staff members from the Regent's office and nine postsecondary faculty from public and private institutions. Committee members are prohibited from submitting proposals. The first review level is conducted by three subcommittees composed of advisory committee members. At this step proposals are examined to determine whether they meet the IHE Eisenhower funding criteria. A second evaluation is conducted by a smaller committee made up of the chairs of the three subcommittees. This second review is an in-depth analysis of the proposals. This committee then makes funding recommendations to the Executive Director of the Regents who has the final decision.

The average length of their programs is one year with an average award amount of about $40,000. There are no site visits conducted due to loss of control over IHE Eisenhower administrative funds.

▶ **Louisiana**

Ron Luckett
Coordinator of Program Planning
State of Louisiana Board of Regents

The Louisiana Board of Regents staff draft the RFP. The RFP system has changed little since 1986 so there is a high degree of familiarity of what is required. The state does not hold workshops, teleconferences, or technical assistance meetings. A committee of out-of-state people selects the RFPs to be funded. Only higher education people are recruited for this committee and they must have a background in science or mathematics. Professors, administrators, and consultants are among those used.

Projects are funded for one-year periods. Their RFP does not have multiple categories and they do not earmark funds. Funds not awarded are rolled over into the "pot" for funding the next year's set of projects. All programs including those seeking another year of funding compete on an equal basis. The average grant is the in range of $30,000 to $45,000. The state has a ceiling of $50,000 per project.

Site visits were started last year. A professional consultant working in cooperation with the Board staff visits each funded project.

▶ **Minnesota**

Nancy Walters
Program Associate/Eisenhower Coordinator
Minnesota Higher Education Coordinating Board

The state's IHE Eisenhower coordinator drafts the RFP and reviews preliminary proposals about two months before the deadline to assist those who may need help. In the past, conferences were held on proposal writing but little increase in proposal quality was noticed so conferences were discontinued.

The proposal evaluation committee is a combination of in-state higher education and K-12 representatives. The IHE Eisenhower coordinator gets recommendations for committee members from teacher and education organizations and agencies.

There is no multiple-year funding. The coordinator and her staff conduct site visits each year. Visits to first-year projects are primarily for observation purposes. The average dollar award per program is about $30,000 with an average length of two weeks. In the RFP, funds are designated for both teacher training programs and programs for underserved populations (i.e., cooperative programs).

▶ **Missouri**

Ava Sagen
Research Analyst for Planning and Federal Grant Programs
Coordinating Board for Higher Education

As a newcomer to this position, the state IHE Eisenhower coordinator was in the process of establishing procedures at the time of the interview. In the past, proposals were evaluated by either exclusively in-state or exclusively out-of-state evaluation committees. The new coordinator would like to use both in-state and out-of-state people, possibly including IHE Eisenhower coordinators from other states. Four information conferences were being held around the state in March 1993 for the state's current RFP due in May. The RFP contains the dates and locations for these conferences.

There is no multiple-year or earmarked funding and only one RFP category. Each program stands on its own each year. The average amount of funding per project is estimated to be at $30,000 to $40,000 (range of less than $10,000 to around $90,000). The time span of each program varies. There are many summer programs.

▶ **Montana**

David Toppen
Executive Associate Commissioner for Higher Education
Montana University System

The state's IHE Eisenhower coordinator drafted the original RFP and has modified it over the years. The RFP content is coordinated with the state's K-12 coordinator to make sure it is in line with the K-12 environment. Two state groups (teachers' associations) also review the RFP and offer comments. There is no formal advisory committee.

The evaluation committee keeps the turnaround time very short. The state has used out-of-state evaluators in the past but used in-state math and science experts this year mainly due to time constraints. The coordinator doesn't feel that they have gained a lot in terms of using out-of-state people. However, his feelings on this issue are mixed since Montana has much in-state expertise that can be tapped.

The coordinator conducts informal site visits unannounced, usually if in the town where the program is ongoing. There is no multiple-year funding and only one RFP category. The average dollar amount awarded per project is $18,500 for the last two years. Average program length has not been calculated but the state is making efforts to increase the length of actual training.

No teleconferences or workshops were held in the past. This year each IHE Eisenhower recipient will be required to participate in one of two planned teleconferences. Each project is required to use the state's extensive telecommunications network for follow-up with participants. Funds are set aside to hire a consultant to train all program directors on the use of this system.

▶ **Nebraska** Larry Scherer
Associate Academic Officer and Legal Counsel
Coordinating Commission for Postsecondary Education

The IHE Eisenhower coordinator writes the RFP and receives some input from an informal group that functions in an advisory capacity (e.g., people from the state department of education, math and science consultants, state SSI people). The coordinator tries to issue the RFP before faculty leave for summer break. No workshops were held in the past but the coordinator plans to offer a grant writing workshop together with a large statewide conference this summer. The greatest proportion of funding for the conference comes from Eisenhower funds. The conference went out to bid and has been held at a private college for the last two years.

In-state people evaluate the proposals. Seven to eight people make up the committee. Committee members are selected from education service units (units involved in staff development), math-science teachers, and higher education representatives in math/science education, math or science. Ex-officio members include math-science consultants from the State Board of Education, the director of the SSI, and people affiliated with related state associations. The state offers multiple-year funding in the sense that current projects are "carry overs" that need more time. There has only been one three-year project funded but they competed each year for funding. The coordinator doesn't think this is practical and would like to fund a program for three years if it's a good project.

There are three categories to their RFP: cooperatives (long-term, ongoing programs whose purposes are to develop relationships among schools at all levels, business/industry, and other agencies), workshops (traditional programs), and the statewide conference. The average award for in-service projects is about $30,000. Projects run about two weeks (one week of workshop and three to four days of follow-up during the academic year). The funding period is determined by the project; the state does not impose time lengths.

The IHE Eisenhower coordinator conducted site visits with all projects last year. This year, site visits will be contracted out. Site visits are for the purpose of program monitoring.

▶ **Nevada** Karen Steinberg
Director of Institutional Research
University of Nevada System

An in-state review committee evaluates the submitted proposals. The committee includes representatives from all levels of the education system. Members are required to have experience in an educational system but they cannot be currently employed by any group affected by IHE Eisenhower funding.

State IHE staff conduct site visits for as many programs as practical. Each visit consists of meetings with project directors and talking to participants. In addition, the projects are monitored through telephone calls, letters, and the review of budget documents. The coordinator for higher education and the project assistant conduct the site visits.

The average award amount is $20,000 to $25,000 with an average program length of three to four weeks. There are no pre-proposal meetings, teleconferences, workshops, or other support services offered.

▶ **New Mexico** Bill Simpson
Senior Research and Policy Analyst
Commission on Higher Education

The state IHE Eisenhower coordinator position has been recently vacated; the person interviewed is temporarily "filling in". The SAE is the primary writer of the RFP. The proposal process is made up of three stages. First, pre-proposals are submitted; second, a meeting is held in one location to cover the Federal content requirements; and third, final versions of RFPs are submitted.

The evaluation committee is made up of eight in-state representatives from postsecondary institutions, other government agencies and national laboratories. Site visits to some projects have been done in the past but none were conducted last year. The average dollar amount awarded per program is $42,500 with the majority being awarded to summer programs with an average length of three weeks. Starting this summer (1993), the RFP will be coordinated with the state's SSI program and will include two categories for proposals: 1) SSI (all summer in-service programs) and 2) math and/or science programs other than summer in-service format.

▶ **North Dakota** Drake Carter
Assistant Coordinator for the Eisenhower Program
Bismarck State College

The IHE Eisenhower coordinator writes the RFP from priorities established by an advisory committee. This committee is comprised of one person from each higher education institution in the state (two-year and four-year, public and private). Proposals are evaluated by an out-of-state evaluation team. This team consists of three people who are recommended by math and science educators. They are from regional higher education institutions.

There is one RFP and no multiple competitions. There are no pre-proposal workshops, conferences, or other support services. The state does offer a voluntary pre-evaluation review. Staff contract with an

outside grant writer to review proposals before their submission; however, there is no guarantee that this will result in funding.

The average of all grants is about $15,000 to $20,000. This average is deceptive because most grants fall at the extreme ends--either very small ($4,000 to $6,000) or very large. Their RFP stresses workshops over "one-shot" presentations. Programs of at least three to four days with 40 hours of active participation are encouraged. All programs must include a follow-up session. This time line represents the average; the state does fund programs that are shorter and longer, but does not fund multiple-year programs.

A site visit is done by an evaluator during the activity stage of a program. The evaluator is typically from the community colleges. Information gathered is used primarily to monitor the participation level in programs and to assess the need for content change due to education reform in teacher preparation programs.

This state co-funds a project with neighboring Minnesota that impacts communities and populations on common borders.

▶ **Oklahoma** Joe Hagy
Director of Special Programs
Oklahoma State Regents for Higher Education

The original RFP was drafted by a committee and staff members of the state board of regents. It is updated as necessary to reflect changes in the Federal guidelines. There have been no formal workshops during the last two years due mainly to the consistency of the grant applicants and recipients. There is some informal computer networking through bulletin boards on IHE Eisenhower projects done by the faculty.

Evaluation of RFPs is done by a committee of all in-state people. The committee is generally composed of 50 percent higher education people and 50 percent K-12 people. The state strives to have one-third administrative representation and two-thirds representation by faculty, department people, and classroom teachers. Vocational and technical education is a separate system in Oklahoma so they include one teacher from applied math or applied science on the evaluation committee.

The state has expanded the required program evaluation component this year. The collection of participant social security numbers will allow for the longitudinal tracking of their future activities. A computer network (Unitized Data System with 70 data elements) is being used to track participating teachers (e.g., Do they take more classes? Do they switch jobs?)

Another new component is an independent evaluation of all programs. Each program will be visited for one day by K-12 teachers hired by the board. The teachers will write an evaluation which will become part of next year's proposal if the program seeks refunding. Each program director can read this evaluation and make written comments to provide additional information for the next evaluation committee. A survey of all program directors will be conducted to assess the performance of the teacher-evaluators during the first year.

The IHE Eisenhower coordinator and/or his staff will conduct random site visits as a liaison activity with no intent to evaluate. There is no money "set aside" for multiple-year funding. Continuing programs

compete for funding on an equal basis with all other RFPs. There are no RFP categories. Awards typically range from $50,000 to $60,000. The range of funding is $5,000 to $90,000. The average program length is about three to six weeks; some programs conduct activities over a one-year period. The funding period is one year.

▶ **Oregon**

Holly Zanville
Associate Vice Chancellor for Academic Affairs
Oregon State System of Higher Education

Oregon's institutions are on a late quarter system, so faculty members are not back on campus until the end of August. This has necessitated two proposal deadlines in previous years. Generally, the guidelines for proposals are sent out in August. Grant competition is traditionally "open." For the first time last year, RFPs were issued beyond the traditional open grant competition. This was done to generate programs in areas of priority not addressed by winning proposals. Proposals are evaluated by a review committee. At least three people on this committee read and evaluate each proposal. In reality, seven to nine people read each proposal beyond the three committee members. These additional people are professors in math and science, minority educators, staff members, curriculum specialists from the K-12 Oregon Department of Education, K-12 teachers, business people, and rural campus representatives. The range of proposal quality is very broad necessitating the establishment of a minimum evaluation point total for funding. Funds that are not awarded go back into the "pot" and are given out as supplemental awards or to address special needs through RFPs.

The state does not conduct site visits or direct program monitoring. This was tried, but the outcome was not found to be of value. Additional projects are funded with the evaluation money. The average dollar amount per award is $35,000 (range of $24,000 to $61,000). Program length is about 15 months. The state does provide multiple-year funding by encumbering money up front. IHE staff do not conduct any workshops, technical assistance sessions, or other type of training and/or meetings.

▶ **South Dakota**

Erica Tallman
South Dakota Eisenhower Higher Education Grants Administrator
Northern State University

The IHE Eisenhower coordinator writes the RFP herself. Any changes of a policy nature (i.e., in priorities or goals) must be approved by the South Dakota Board of Regents. The evaluation committee has three out-of-state members who are higher education people with a background in math or science but not necessarily in education. The state funds about 10 projects of $15,000 to $30,000 each year with an average award of $20,000. The IHE Eisenhower coordinator uses teleconferencing to consult with people because there is no funding to conduct workshops or conferences.

The state gets so little money that they generally don't consider funding multiple-year projects. The average length of programs is about one week plus follow-up activities during the academic year. There are three RFP categories: 1) focused training (e.g. a conference of teachers engaged in reform; teachers-teaching-teachers), 2) teacher training, and 3) providing direct service to students (i.e., cooperative programs). Teacher training receives most of the funding with small dollar amounts for the other two.

Priority for site visits is given to all new programs and program directors. The IHE Eisenhower coordinator tries to visit all programs but sometimes can't due to scheduling conflicts.

▶ **Texas**

Nan Roussard
Director
Texas Higher Education Coordinating Board

The IHE Eisenhower coordinator drafts the RFP. Responding to the RFP is a two-step process where the first step is optional. The optional first step is a 150-word abstract plus a four-page narrative and is primarily beneficial for those who have little or no grant writing experience. The IHE Eisenhower coordinator reads these preliminary proposals and sends feedback to the writers. If special assistance is required, the coordinator functions as the liaison between the writers and the experts. In addition, a technical assistance meeting is held in January. This meeting draws about 400 people and includes experts in all areas of proposal writing, evaluation, and content to help in the preparation of the final RFP which is due at the beginning of March.

Proposal evaluation is done primarily by out-of-state evaluators. There are specialized review panels (i.e., one for math; one for science). Each panel has a minimum of four people and at least one person on each panel must be from in-state if someone is available and does not have a vested interest in the programs.

There are two funding cycles: a summer cycle and a "regular" cylce. Summer programs are funded for five months (May to September 30) from residuals from the previous years' grants. "Regular" funding is used to support cooperative and teacher training programs using the state's current Federal allocation.

About one-quarter of all projects are visited by administrative staff. Staff try to visit projects that have not been visited recently, have not been visited at all, or those that may have problems. The purpose of these visits is not to evaluate, but rather to see if the program is operational, meet the teachers, find out if problems exist, and observe the project itself.

If money is available, the state considers funding projects for more than one year; however, the project must stand on its own merit in the evaluation process each year. The average dollar amount per award is $35,000 (average is for both funding cycles). Program length averages a minimum of three weeks with some running an entire year.

▶ **Utah**

Mark Spencer
Assistant Commissioner of Academic Affairs
Utah State Board of Regents

Proposal criteria are developed in consultation with curriculum specialists from the SAE and are aligned with overall state plans. A meeting is also held with IHE faculty to ensure that RFPs are aligned with their expectations. There is a two-hour, pre-proposal meeting for all school district math and/or science specialists, as well as higher education people, to review the RFP and submission/selection process. The meeting serves a dual purpose by incorporating discussion on the direction the state needs to go in math/science education and training.

The state usually receives about 25 responses to the RFP, of which approximately 12 are funded. Awards average $40,000. The average length of funded programs is 15 days of actual training during an academic year. There are no multiple categories for the RFP. Three out-of-state evaluators review each proposal. The community in Utah is too small to allow the use of in-state evaluators.

Utah's IHE Eisenhower administrator visits each project once during the funding year to make sure it is up and running--"doing what it is supposed to do." This site visit does not include an evaluation component.

► **Washington** David Kennedy
Director of Curriculum
Office of the Superintendent of Public Instruction

A needs assessment conducted at the K-12 level is aggregated to determine criteria for proposals. No formal training sessions or meetings are scheduled, but the IHE Eisenhower coordinator is available by request to conduct workshops. The IHE Eisenhower coordinator will also provide them on his own initiative if he notices that one institution has consistently poor quality responses.

Proposals are reviewed by a committee made up of peers or "consumers," business/industry, government, and higher education people *not* involved in teacher preparation. Site visits are conducted randomly unless a program appears "marginal" for some reason. The IHE Eisenhower coordinator does spend time with all new programs and conducts all site visits himself. The IHE Eisenhower coordinator views the site visits as a quality control mechanism.

If funds are carried over, a new RFP is issued to fund additional programs. Multiple-year funding only exists in this context. The state has a law requiring all funding to end at the end of August. On a per program basis, the average dollar amount is $35,000 and the average program length is two and one-half to three weeks.

This state has a statewide newsletter administered by one institution. It goes to all public and private institutions and describes all in-service offerings in the state. This activity is funded through competitive IHE Eisenhower funds.

► **Wyoming** Bill Futrell
Science, Mathematics, Environmental Education and Eisenhower Coordinator
Wyoming State Department of Education

The committee evaluating the RFPs is composed of at least one practicing teacher in addition to community college representatives and university representatives (not from submitting departments). The state does not use out-of-state evaluators. The IHE Eisenhower coordinator makes sure that there are several representatives trained in science and mathematics on the committee.

All of the RFPs are generally funded and the dollar amounts awarded range from $600 to $300,000. The University of Wyoming (the only IHE in the state) gets $300,000 and community colleges get lesser amounts. All submitting departments at the University of Wyoming must coordinate their efforts for this single submission and all programs must meet IHE Eisenhower criteria. This process is not competitive. One year is the average program length.

Technical assistance is provided one-on-one. The IHE Eisenhower coordinator sometimes will do workshops on grant writing. Again, the size of the state greatly influences the type of technical assistance offered. The IHE Eisenhower coordinator conducts site visits and usually visits all programs. The site visits are in the nature of a monitoring function and there is no evaluation component to the visit.

APPENDIX G

Side-by-Side Analysis of Arizona IHE Eisenhower RFPs

Institute researchers examined RFPs for the three most recent funding periods. Sections of each RFP were compared against one another. In some cases, the wording and intent of the RFPs has remained the same over time. In other cases, minor wording changes have been made, while the intent of the previous RFP was preserved. In several other cases, substantive changes were made not only in wording but also in intent.

In the charts that follow, the 1991 Phase I grant competition serves as the baseline for subsequent comparisons. Changes in various sections are noted throughout the document. Words are struck that were eliminated. Words are italicized that represent new language. In some cases, wording remained the same but the section number or placement of an item was changed. References to previous documents are noted where appropriate.

11991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
8. Evaluation Criteria and Procedures -- *continued* f. The extent to which the evaluation plan is well designed and feasible. g. The extent to which the proposal reflects cooperative planning and commitment from the institutions involved in the proposal, both for the project period and beyond, and how the proposal would enhance each institution's capacity to address minority student achievement issues.	**8. Evaluation Criteria and Procedures** -- *continued* f. No change from previous cycle g. The extent to which the proposal reflects cooperative planning and commitment from the institutions involved in the proposal, both for the project ~~period~~ *'s duration* and beyond~~, and how the proposal would enhance each institution's capacity to address minority student achievement issues.~~	**9. Evaluation Criteria and Procedures** -- *continued* *f. Application Commitment and Capacity (10 points). Each application will be reviewed to determine the applicant's commitment to the project, relevant qualifications and experience of personnel, and the likelihood that the project will continue when Federal assistance ends.*
9. Approval and Announcement Notification date	**9. Approval and Announcement** Updated	**10. Approval and Announcement** Updated
10. Contact for Additional Information ABOR representative	**10. Contact for Additional Information** *New* ABOR representative	**11. Contact for Additional Information** *New* ABOR representative

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
8. Evaluation Criteria and Procedures -- *continued*	**8. Evaluation Criteria and Procedures** -- *continued*	**9. Evaluation Criteria and Procedures** -- *continued*
c. The extent to which the personnel are involved are qualified to conduct the project.	c. No change from previous cycle	*c. Evaluation Plan: (15 points). Each application will be reviewed to determine the quality of the evaluation plan for the project, including the extent to which: (1) Evaluation methodology is appropriate for the project activities; (2) Predicted instructional outcomes correlate to evaluation objectives; (3) Reporting addresses (a) Pre/post test data of content knowledge gains; and (b) classroom observation data for 25 percent of teacher participants; and (4) The evaluation design enhances the potential for disseminating information and replicating the project.*
d. The extent to which facilities, programs, and other resources of the institutions involved in the project are appropriate and available to support the project to a successful conclusion.	d. No change from previous cycle	*d. Underrepresented Student Access: (15 points). Each application will be reviewed to determine the extent to which: (1) The programmatic design addresses the learning needs of all students and motivates, supports and encourages underrepresented students to achieve in these subject areas; (2) The recruitment and selection plan seeks and encourages participation by teachers of underrepresented students; and (3) Activities are designed to address and reduce the effect of historical and unconscious low expectations and negative attitudes of teachers.*
e. The extent to which the proposed budget is reasonable in relation to the objectives and activities of the project.	e. No change from previous cycle	*e. Budget and Cost Effectiveness: (10 points). Each application will be reviewed to determine the extent to which: (1) The budget is cost effective and adequate to support the proposed project; (2) Applicant provides a detailed narrative explanation for each budget requested items; (3) There is evidence of a clear relationship between the cost of the budget request, project objectives and anticipated results; and (4) Reasonable participant stipends are designated for tuition, fees, books, materials, travel and/or other expenses that are demonstrably essential to the achievement of objectives and the project's integrity.*

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
8. Evaluation Criteria and Procedures -- *continued*	**8. Evaluation Criteria and Procedures** -- *continued*	**9. Evaluation Criteria and Procedures** -- *continued*
a The extent to which the need is clearly defined, justified, and documented.	a. No change from previous cycle	*a. Demonstrated Need and the Improvement of the Quality of Teaching and Instruction: (25 points). Each application will be reviewed to determine the extent to which the project will contribute to improved teaching and instruction in mathematics and science including: (1) Evidence of how mathematics/science learning needs are assessed; (2) Objectives that emphasize conceptual mastery of mathematics or science knowledge; (3) Evidence of project's use of nationally recognized programs or materials; (4) Evidence of effective teaching strategies with clearly specific criteria and outcomes; and (4) Description of how instructional faculty intend to model appropriate teaching behaviors and methods.*
b The extent to which the project is likely to increase the knowledge and instructional skills of elementary, middle, or secondary teachers and/or students who will be participants in the project.	b. No change from previous cycle	*b. Plan of Operation: (25 points). Each application will be reviewed to determine the quality of the project's plan of operation, including: (1) Evidence that school districts are involved in the development of the proposed activity and the quality of their intent to collaborate in its implementation; (2) Evidence of efficient project administration; (3) Utilization of resources and personnel to achieve each objective, including a description of responsibility of all key personnel, and (4) A clear description of the plan for recruiting and selecting teachers that assures the equitable participation of teachers of underrepresented and economically disadvantaged students; private school teachers and students, and teachers and students from underrepresented racial and ethnic groups.*

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
6. Format for Proposals -- *continued* f. Appendices -- Each proposal must have: (1) Certificate of Assurances, (2) Brief resumes of key personnel, (3) LEA and other agreements, and (4) Additional supplementary materials that are directly relevant to the project and which may be useful in the evaluation of the proposal, including a brief narrative or past history of commitment to ethnic minority achievement issues and/or a brief narrative or past history of cooperative programs with other education systems.	**6. Format for Proposals** -- *continued* f. Appendices -- Each proposal must have: (1) No change from previous cycle (2) No change from previous cycle (3) No change from previous cycle (4) Additional supplementary materials that are directly relevant to the project and which may be useful in the evaluation of the proposal, ~~including a brief narrative or past history of commitment to ethnic minority achievement issues and/or a brief narrative or past history of cooperative programs with other education systems.~~	**7. Format for Proposals** -- *continued* f. No change from previous cycle
7. Submission of Proposals. Fifteen (15) complete copies of the proposal must be received at the office of the Arizona Board of Regents... by [deadline date].	**7. Submission of Proposals**. ~~Fifteen (15)~~ *Ten (10)* complete copies of the proposal must be received at the office of the Arizona Board of Regents... by [deadline date].	**8. Submission of Proposals**: No change from previous cycle
8. Evaluation Criteria and Procedures An evaluation panel will be appointed by the Board of Regents staff and will include Operating Committee members of AMEAAC. The panel will review each eligible proposal submitted and will recommend for funding those proposals that demonstrate the greatest potential for accomplishing the objectives of the Eisenhower Mathematics and Science Grant Program. The following criteria will guide the evaluation process:	**8. Evaluation Criteria and Procedures** An evaluation panel ~~will be~~ appointed by the Board of Regents staff ~~and will include Operating Committee members of AMEAAC. The panel~~ will review each eligible proposal submitted and will recommend for funding *to the Executive Director of the Arizona Board of Regents* those proposals that demonstrate the greatest potential for accomplishing the objectives of the Eisenhower Mathematics and Science Grant Program *and the state plan*. The following criteria will guide the evaluation process:	**9. Evaluation Criteria and Procedures** No change from previous cycle

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
6. Format for Proposals -- *continued* c. Evaluation Method -- Each proposal must include a description of the methods that will be used to evaluate the progress of the project and its effectiveness in accomplishing stated goals and objectives. d. Time Table -- Each proposal must include a time table showing each of the major Phase I and Phase II activities of the project, the name of the person who will be responsible for each activity, and the start and end dates for each activity. The dates must not extend beyond [date]. e. Budget -- Each proposal must include a budget submitted on the standard budget request form and a detailed explanation of each budget line. Budgets must include the cost of attending one statewide AMEAAC conference to be held in Phoenix in 1992 to discuss Eisenhower projects funded through this Request for Proposals. Budgets may not include (1) requests for capital equipment, (2) requests for out-of-state travel, or (3) requests for funding both tuition/registration fees for classes and instructor salaries for those classes. Indirect costs may not exceed 5% of the total budget.	**6. Format for Proposals** -- *continued* c. No change from previous cycle d. Time Table -- Each proposal must include a time table showing each of the major ~~Phase I and Phase II~~ activities of the project, the name of the person who will be responsible for each activity, and the start and end dates for each activity. The dates must not extend beyond [date]. e. Budget -- Each proposal must include a budget submitted on the standard budget request form and a detailed explanation of each budget line. Budgets ~~must~~ *should* include the ~~cost of attending one statewide AMEAAC~~ *funds to attend an in-state* conference ~~to be held in Phoenix in 1992 to discuss Eisenhower projects funded through this Request for Proposals.~~ *of the applicant's choice to disseminate the results of the project. Budgets may include stipends for participants to cover tuition costs or instructor salaries but* <u>not</u> *both.* Budgets may not include (1) requests for capital equipment, (2) requests for out-of-state travel, or (3) requests for funding both tuition/registration fees for classes and instructor salaries for those classes. Indirect costs may not exceed 5% of the total budget.	**7. Format for Proposals** -- *continued* c. No change from previous cycle d. No change from previous cycle e. Budget -- Each proposal must include a budget submitted on the standard budget request form and a detailed explanation of each budget line. Budgets should include the funds to attend an in-state conference of the applicant's choice to disseminate the results of the project. Budgets may include stipends for participants to cover tuition costs or instructor salaries but <u>not</u> both. Budgets may not include (1) requests for capital equipment,*or* (2) requests for out-of-state travel~~, or (3) requests for funding both tuition/registration fees for classes and instructor salaries for those classes.~~ Indirect costs may not exceed 5% of the total budget.

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
5. Eligible Applicants: All Arizona public and non-profit private colleges, universities, and community colleges are eligible to submit proposals. Elementary and secondary school proposals must be submitted with a college, university, or community college serving as fiscal agent.	**5. Eligible Applicants**: All Arizona public and non-profit private colleges, universities, and community colleges are eligible to submit proposals. *Proposals initiated by* Elementary, *middle*, and secondary schools *can* ~~proposals must~~ be submitted *only under the sponsorship of* ~~with~~ a college, university, or community college serving as fiscal agent. *Proposals are also solicited from consortia of institutions of higher education.*	**6. Eligible Applicants**: No change from previous cycle
6. Format for Proposals a. Cover Sheet b. Narrative -- The project narrative should not exceed five double-spaced typewritten 8 1/2" x 11" pages. It should include the following information: (1) A statement of the need and significance; (2) Identification of project goals and objectives; (3) Description of Phase I planning activities; (4) Description of Phase II activities that will be conducted to accomplish the objectives; (5) Identification of the teacher and/or student group or groups that will benefit; (6) Identification of other agencies, schools, colleges, or organizations that will participate; (7) Identification of the project director(s) and other key personnel ...	**6. Format for Proposals** a. No change from previous cycle b. Narrative -- The project narrative should not exceed five double-spaced typewritten 8 1/2" x 11" pages. It should include the following information: (1) No change from previous cycle (2) No change from previous cycle (3) Description of ~~Phase I planning activities;~~ ~~(4) Description of Phase II~~ *the* activities that will be conducted to accomplish the objectives *and evidence of an understanding of and appreciation for cultural differences in learning styles*; (4) No change from previous cycle **[Reference 1991:I, 6.b.5]** (5) Identification of *any* other agencies, schools, colleges, or organizations that will participate in the project; (6) No change from previous cycle **[Reference 1991:I, 6.b.7]**	**7. Format for Proposals** a. No change from previous cycle b. Narrative -- The project narrative should not exceed ~~five~~ *seven* double-spaced typewritten 8 1/2" x 11" pages. It should include the following information: (1) No change from previous cycle (2) No change from previous cycle (3) Description of the *substantive* activities that will be conducted to accomplish the objectives and evidence of an understanding of and appreciation for cultural differences in learning styles; (4) Identification of the ~~teacher and/or student group or~~ *target* groups that will benefit from the project; (5) No change from previous cycle *(6) Identification of strategies effective in serving the underrepresented;* *(7) Relationship, if any, of project to ongoing underrepresented and underserved group programs or participating universities, colleges, or schools;* *(8) Identification of a plan for continuing support for participants;* *(9) Identification of a dissemination plan for future implementation; and* (10) No change from previous cycle **[Reference 1991:II, 6.b.6]**

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
		NEW Section 4 ***4. Conditions Covering All Awards*** *a.* *Funding requests of any application will be limited to a maximum of $70,000.* *b.* *Indirect costs will be limited to 5 percent (5%).* *c.* *Project funding levels are subject to negotiation.* *d.* *Rate of compensation of individuals under this program should not exceed the regular rate of compensation paid by the institution for comparable work.* *e.* *Stipends for participating teachers are encouraged but may not exceed $40 per day.* *f.* *Monies to cover tuition expenses for teachers may be included in the budget.* *g.* *Funds may be budgeted for student costs such as travel and housing, but no stipends may be paid to students.* *h.* *Funds cannot be used to finance capital expenditures or office equipment.* *i.* *All funds must be expended by [date].*
4. Funds Available: Federal dollars available	**5. Funds Available**: Change in dollar amount	**5. Funds Available**: Change in dollar amount

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
3. General Information -- *continued*	**3. General Information** -- *continued*	**3. General Information** -- *continued*
d. No pre-award costs will be allowed. Two-year proposals are encouraged. In order to ensure maximum cooperative planning among institutions, proposals must identify a Phase I planning process of up to six months and a Phase II implementation process for the remainder of the proposal period.	e. Federal grant funds must be used to supplement, not supplant, funds from non-federal sources. Although institutional matching funds are not required, such support will be an acceptable and welcome part of any project budget proposal. **[Reference 1991:I, 3.e]**	e. No change from previous cycle
e. Federal grant funds must be used to supplement, not supplant, funds from non-federal sources. Although institutional matching funds are not required, such support will be an acceptable and welcome part of any project budget proposal.	f. No pre-award costs will be allowed. ~~Two-year proposals are encouraged. In order to ensure maximum cooperative planning among institutions, proposals must identify a Phase I planning process of up to six months and a Phase II implementation process for the remainder of the proposal period.~~ **[Reference 1991:I, 3.d]**	f. No change from previous cycle
f. Support for in-service training and retraining may include the provision of stipends for participation in institutes authorized under this act or any other program of the National Science Foundation.	g. No change from previous cycle **[Reference 1991:I, 3.f]**	[Eliminate 1991:II, 3. g-i]
g. A maximum of five percent of the grant funds may be used to cover indirect costs of the administering institution.	h. No change from previous cycle **[Reference 1991:I, 3.g]**	
h. All directors of grant projects which are selected for funding must sign and comply with the Certificate of Assurance included as Attachment 3.	i. No change from previous cycle **[Reference 1991:I, 3.h]**	
i. Proposals are encouraged to creatively seek to involve schools and community colleges located in rural Arizona.	~~i. Proposals are encouraged to creatively seek to involve schools and community colleges located in rural Arizona.~~	

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
3. General Information -- *continued*	**3. General Information** -- *continued*	**3. General Information** -- *continued*
b. An institution submitting a project must enter into a joint planning and implementation agreement reflecting the cooperative arrangement selected. In addition, any proposal containing a B (1) (3-4) program, must enter into an agreement with one or more local education agencies to provide the retraining or in-service for the elementary and secondary teachers in those LEAs. The required agreements must be submitted in writing with the proposal. Proposals that do no include the appropriate agreements will be disqualified.	b. ~~An institution submitting a project~~ *In order for an institution of higher education to receive federal funds for projects described in 2b., 2c., and 2d. above, the institution submitting a project* must enter into ~~a joint planning and implementation agreement reflecting the cooperative arrangement selected. In addition, any proposal containing a B (1) (3-4) program, must enter into~~ an agreement with one or more local education agencies to provide the retraining or in-service for the elementary and secondary teachers in those LEAs. *This requirement has been interpreted to mean that LEAs must be involved n the planning and evaluation of the project.* The required agreements must be submitted in writing with the proposal. Proposals that do not include the appropriate agreements will be disqualified.	b. In order for an institution of higher education to receive federal funds for projects described ~~in 2b., 2c., and 2d.~~ above, the institution submitting a project must enter into an agreement with one or more local education agencies to provide the retraining or in-service for the elementary and secondary teachers in those LEAs. This requirement has been interpreted to mean that LEAs must be involved in the planning and evaluation of the project. *In the agreement or proposal, the institution of higher education shall provide evidence that proposed projects and activities are the results of cooperative planning with local school district(s) and the institution of higher education.* The required agreements must be submitted in writing with the proposal. Proposals that do not include the appropriate agreements will be disqualified.
	c. *Each institution of higher education which receives federal funds under the provisions of this grant program shall assure that the program will take into account the need for greater access to, and participation in, mathematics and science for careers for students from historically underrepresented and underserved groups including females, minorities, individuals with limited English proficiency, the handicapped, and migrants, as well as gifted and talented students.*	c. No change from previous cycle
c. Federal funds for those projects which are selected will be available any time after notification of award for expenditure through [date]. No project expenditure of any kind may be made after that date.	d. No change from previous cycle **[Reference 1991:I, 3.c.]**	d. No change from previous cycle

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
Proposal Solicitation -- *continued* Proposals that target the training needs of elementary and middle school mathematics and science educators are encouraged.	Proposals that target the training needs of elementary and middle school mathematics and science educators are encouraged *and will receive* ***priority funding***. Project directors are encouraged to creatively seek to involve K-12 schools and community colleges located in rural Arizona. As part of the follow-up activities, project directors are encouraged to identify and attend an in-state conference to disseminate the results of the project.	***In all of the above priorities, preference will be given to projects that significantly impact students from historically underrepresented and underserved groups, including females, minorities, individuals with limited English proficiency, the handicapped, migrants, and the gifted. In addition,*** proposals that target the training needs of elementary and middle school mathematics and science educators ~~are encouraged and~~ will receive priority funding. No change from previous cycle
3. General Information a. Projects submitted under section 2 above must be cooperative projects between an institution of higher education and one or more local education agencies. In addition we encourage a linkage with a state education agency, private industry, a tribal government, or non-profit organization. Proposals are also solicited from consortia of institutions of higher education and external organizations.	**3. General Information** a. Projects submitted under section 2*a* above must be cooperative projects between an institution of higher education and ~~one or more~~ local education agencies. ~~In addition, we encourage a linkage with a~~ *It is also encouraged that* state education agenc*ies*, private industry, ~~a tribal government, or~~ and non-profit organizations *be involved*. ~~Proposals are also solicited from consortia of institutions of higher education and external organizations.~~ *Competitive projects will demonstrate clear involvement of personnel from at least one local education agency in planning, implementation, and project evaluation.*	**3. General Information** a. Projects submitted ~~under section 2*a*~~ above must be cooperative projects ~~between an~~ *involving* institutions of higher education and local education agencies. It is also encouraged that state education agencies, private industry, and non-profit organizations be involved. ~~Competitive~~ projects ~~will~~ *must* demonstrate clear involvement of personnel from at least one local education agency in planning, implementation, and project evaluation.

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
Proposal Solicitation -- *continued* 2) increase the number of ethnic minority community college students transferring to teacher preparation programs who would specialize in teaching mathematics and science at the elementary or secondary school level; 3) increase the number of ethnic minority college or university students entering or persisting in teacher preparation programs who would specialize in teaching mathematics and science at the elementary or secondary school level; 4) retrain ethnic minority teachers who now specialize in disciplines other than mathematics and science in the teaching of mathematics and science, or retrain mathematics and science ethnic minority teachers to expand their areas of specialization; 5) increase the number of ethnic minority citizens who are professionals in mathematics and science-related fields and who would specialize in teaching mathematics and science at the secondary level through the Arizona Alternative Secondary Certification Program.	**Proposal Solicitation** -- *continued* d. Provide in-service training for elementary, secondary, and vocational school teachers and other appropriate school personnel who are from ethnic minority groups or who teach in schools that have large percentages of students from ethnic minority groups to improve their teaching skills in the fields of mathematics and science, ~~including the Arizona Science and Mathematics Essential Skills~~ **[Reference 1991:I, 2.B.1]**; or e. Increase the number of ethnic minority college or university students entering or persisting in teacher preparation programs who would specialize in teaching mathematics and science at the elementary or ~~secondary~~ *middle* school level **[Reference 1991:I, 2.B.3]** [Eliminate 1991:I, 2.B.2 and 2.B.5]	**Proposal Solicitation** -- *continued* d. Provide in-service training for elementary, secondary, and vocational school teachers and other appropriate school personnel who are from ethnic minority groups or who teach in schools that have large percentages of students from ethnic minority groups to improve their teaching skills in the fields of mathematics and science, *e.g., to:* • *increase competence of teachers to provide integrated, inquiry, hands-on science and mathematics education; or* • *disseminate or implement hands-on mathematics and science programs that disseminate the NCTM (National Council of Teachers of Mathematics) standards; or* • *disseminate or implement nationally recognized exemplary science programs; or* • *implement programs in hands-on mathematics, science, or integrate mathematics and science programs that support the statewide systemic initiative project;* or e. No change from previous cycle

1991: Phase I RFP (Baseline)	1991: Phase II RFP	1992 RFP
1. Introduction	**1. Introduction**	**1. Introduction**
The introduction states the availability of funds and introduces ABOR as the designated agency to administer the funds.	No change from previous cycle	No change from previous cycle
Arizona Minority Education Access and Achievement Cooperative (AMEAAC) is introduced to assist in the distribution of funds.	Reference to AMEAAC eliminated	
Proposals from eligible public or private non-profit institutions of higher education that seek to work cooperatively to meet this RFP's goals are actively sought.	Proposals from eligible public or private non-profit institutions of higher education ~~that seek to work cooperatively to meet this RFP's goals~~ are actively sought.	
2. Proposals are being solicited which will:	**2. Proposals are being solicited which will:**	**2. Proposals are being solicited which will:**
A. Improve K-12 ethnic minority student understanding and performance in science and mathematics; or	a. Improve ~~K-12~~ ethnic minority student understanding and performance in science and mathematics *through increased capabilities of teachers*; or	a. No change from previous cycle
B. Establish or provide teacher training, retraining, or in-service programs designed to:	b. *Establish traineeship programs for new teachers from underrepresented ethnic minority groups. The new teachers must specialize in teaching mathematics and science at the elementary, middle school, or secondary level*; or	b. No change from previous cycle
1) provide in-service training for elementary, secondary, and vocational school teachers and other appropriate school personnel who are from ethnic minority groups or who teach in schools that have large percentages of students from ethnic minority groups to improve their teaching skills in the fields of mathematics and science, including the Arizona Science and Mathematics Essential Skills;	c. Retrain ethnic minority teachers who now specialize in disciplines other than mathematics and science in the teaching of mathematics and science, or retrain mathematics and science ethnic minority teachers to expand their areas of specialization **[Reference: 1991:I, 2.B.4]**, or	c. No change from previous cycle

APPENDIX H

Arizona IHE Eisenhower Programs (1990-1993)

This appendix summarizes some of the critical features of Arizona IHE Eisenhower-funded programs. Information was derived exclusively using project proposals provided for review by the Arizona Board of Regents and is summarized in Tables H-1 through H-4, and in Figure H-1.

▶ **Table H-1 provides information about grant amounts and project time frames.**

Table H-1 indicates the following:

- An average of ten programs are funded per year.
- Grant awards average slightly under $48,000 per program.
- The average length of a program is 16 months.

In the past three years, Northern Arizona University and the University of Arizona have been awarded over twice as many Eisenhower grants (ten each) as has Arizona State University (four) and over three times as many awards as have been granted to Arizona State University-West or community colleges as a whole (three each). No grants have been awarded to a private institution of higher education during the past three years[1]. Regarding the distribution of Eisenhower monies, Northern Arizona University has received the lion's share of awards for two of the past three years (68 percent of the total allocation in FY 1990-91; 33 percent in FY 1992-93), while the University of Arizona was awarded 42 percent of the total allocation in FY 1991-92.

▶ **Table H-2 indicates the type of program funded, and focus on minorities.**

It should be noted that all programs allude to serving minority student populations. This analysis focuses on the extent to which programs are *explicit* in identifying and targeting minority teachers as participants. A majority of programs funded are in-service programs focusing on teachers of minority students. Not unexpectedly, Northern Arizona University concentrates on teachers working with Native American students, while University of Arizona places emphasis on the Hispanic student community. Very few programs have sought to train minorities to be teachers of mathematics and/or science, or have focused attention on retraining teachers to specialize in these areas or expand their expertise.

▶ **Table H-3 shows teacher participant grade levels and program training emphases.**

The table shows the grade level of teachers targeted for participation, as well as the program focus of the training relative to mathematics, science, or both with respect to both content and pedagogy. Table H-3 indicates that:

[1] This information is based exclusively on the analysis of the distribution of funded projects. Information regarding the total number of proposals submitted per institution was unavailable for analysis. Institutions receiving more grants may well be submitting more proposals.

- 24 of 30 programs (80 percent) have focused attention on elementary and/or middle school teachers; nine (30 percent) have worked with high school teachers.

- Science (content and/or pedagogy) has been the focus of almost twice as many efforts than mathematics. Fifteen programs have emphasized science (50 percent) in comparison with nine programs emphasizing mathematics (30 percent) and six programs (20 percent) emphasizing both math and science with respect to content and/or pedagogy).

Table H-1: Arizona Eisenhower Program Funding and Time Lines

Year	IHE: Project	Amount	Time Frame (Start-End Dates)
1990-91	NAU: Critical MASS (Math & Science Specialists)	$33,778	21 months (Jan 91 - Sept 92)
	NAU: Hopi Teacher Enhancement	$46,183	21 months (Jan 91 - Sept 92)
	NAU: Earth Science in Elementary Schools	$86,478	21 months (Jan 91 - Sept 92)
	ASU: Projects TEAMS	$45,612	19 months (Mar 91 - Sept 92)
	U/A: Research Traineeships for New Minority Teachers	$18,000	19 months (Mar 91 - Sept 92)
	U/A: Recombinant DNA Technology	$27,678	18 months (Apr 91 - Sept 92)
	NAU: AZ Science Environmental Education Development (ASEED)	$73,866	12 months (Jan 91 - Dec 91)
	U/A: Image Processing for Teaching	$26,501	12 months (Mar 91 - Feb 92)
	NAU: Instructional Improvement in School Mathematics (Phase 2)	$7,831	7 months (June 91 - Dec 91)
1991-92 Phase I	U/A: Carneval Matematico	$48,023	24 months (Sept 91 - Sept 93)
	ASU: Coalition for American Indian Mathematics & Science Education (Project PRIME)	$33,049	24 months (Sept 91 - Sept 93)
	NAU: Community Science Programs	$44,171	23 months (Sept 91 - July 93)
	ASU-West: Family-School Cooperative	$30,001	22 months (Sept 91 - June 93)
	ASU: Math Enhancement for the Gila River Indian Community	$43,906	12 months (Sept 91 - Aug 92)
1991-92 Phase II	SMCC: Hands-On Mathematics	$50,297	21 months (Jan 92 - Sept 93)
	MCC: Grow Your Own	$37,100	21 months (Jan 92 - Sept 93)
	U/A: Current Topics for Biology Teaching	$39,503	21 months (Jan 92 - Sept 93)
	U/A: Teachers Using Insects in Science/Math	$40,400	21 months (Jan 92 - Sept 93)
	U/A: Family Science	$49,949	21 months (Jan 92 - Sept 93)
	U/A: Spanish Language NASA Materials	$36,100	17 months (Jan 92 - May 93)
	NAU: ASEED Expansion	$62,000	12 months (Jan 92 - Dec 92)

Table H-1--*continued*

Year	IHE: Project	Amount	Time Frame (Start-End Dates)*
1992-93	NAU: Marvelous World of Molecules	$50,493	17 months (Jan 93 - May 94)
	NAU: Development of Secondary Earth Science Curriculum	$69,808	12 month (Jan 93 - Dec 93)
	ASU: Math Enhancement for the Gila River Indian Community (Extension)	$69,126	9 months (Jan 93 - Sept 93)
	ASU-West: Math/Science in Rural Schools	$66,882	9 months (Jan 93 - Sept 93)
	NAU: Modern Physics for Middle School Teachers	$60,618	9 months (Jan 93 - Sept 93)
	U/A: Middle School Science	$40,320	9 months (Jan 93 - Sept 93)
	U/A - Sierra Vista: Primary Science/Math Partnerships	$69,851	9 months (Jan 93 - Sept 93)
	SMCC: Hands-On Mathematics	$69,519	8 months (Feb 93 - Sept 93)
	ASU-West: Pre-Algebra Academy	$52,661	7 months (Mar 93 - Sept 93)
	* **NOTE**: Projects are required to spend monies between Jan 93 and Sept 93. Project time lines may extend beyond that time period.		

Table H-2: Types of Eisenhower Programs in Arizona and Focus on Minorities

Year	IHE: Project	Type of Program				Minority Focus	
		Coop	Train	Re-train	In-service	Tchrs of Minorities	Minority Teachers
1990-91	NAU: Critical MASS				✓	✓	
	NAU: Hopi Teacher Enhancement	✓			✓	✓	
	NAU: Earth Science in Elem. Schools				✓	✓	
	ASU: Projects TEAMS			✓	✓	✓	
	U/A: Research Traineeships for New Minority Teachers		✓				✓
	U/A: Recombinant DNA Technology				✓	✓	
	NAU: AZ Science Environmental Education Development (ASEED)				✓	✓	
	U/A: Image Processing for Teaching				✓	✓	
	NAU: Instructional Improvement in School Mathematics (Phase 2)				✓	✓	
1991-92 Phase I	U/A: Carneval Matematico	✓			✓	✓	
	ASU: Coalition for American Indian Mathematics & Science Education (Project PRIME)	✓		✓	✓	✓	
	NAU: Community Science Programs	✓			✓	✓	
	ASU-West: Family-School Cooperative				✓	✓	
	ASU: Math Enhancement for the Gila River Indian Community	✓			✓	✓	
1991-92 Phase II	SMCC: Hands-On Mathematics				✓	✓	
	MCC: Grow Your Own		✓				✓
	U/A: Current Topics for Biology				✓	✓	
	U/A: Using Insects in Science/Math				✓	✓	
	U/A: Family Science				✓	✓	
	U/A: Spanish Language NASA Materials				✓	✓	
	NAU: ASEED (Extension)				✓	✓	

Table H-2--*continued*

Year	IHE: Project	Type of Program				Minority Focus	
		Coop	Train	Re-train	In-service	Tchrs of Minorities	Minority Teachers
1992-93	NAU: Marvelous World of Molecules				✓	✓	
	NAU: Development of Secondary Earth Science Curriculum				✓	✓	
	ASU: Math Enhancement for the Gila River Indian Community (Extension)	✓			✓	✓	
	ASU-West: Math/Science in Rural Schools				✓	✓	
	NAU: Modern Physics for Middle School Teachers				✓	✓	
	U/A: Middle School Science				✓	✓	
	U/A - Sierra Vista: Primary Science/Math Partnerships		✓		✓	✓	
	SMCC: Hands-On Mathematics				✓	✓	
	ASU-West: Pre-Algebra Academy	✓			✓	✓	

Table H-3: Arizona Teachers Served By Eisenhower Programs and How Served

Year	IHE: Project	Teacher Grade Level			Program Emphasis			
		Elem (K-5)	MS (6-8)	HS (9-12)	Mathematics		Science	
					Cont	Pedag	Cont	Pedag
1990-91	NAU: Critical MASS			✓	✓	✓	✓	✓
	NAU: Hopi Teacher Enhancement	K-6				✓		✓
	NAU: Earth Science in Elem. Schools	✓					✓	✓
	ASU: Projects TEAMS	4-8			✓	✓		
	U/A: Research Traineeships for New Minority Teachers	College student trainees					✓	✓
	U/A: Recombinant DNA Technology			✓			✓	✓
	NAU: AZ Science Environmental Education Development (ASEED)	4-8					✓	✓
	U/A: Image Processing for Teaching		✓	✓			✓	✓
	NAU: Instructional Improvement in School Mathematics (Phase 2)		✓	✓	✓	✓		
1991-92 Phase I	U/A: Carneval Matematico		✓		✓	✓		
	ASU: Coalition for American Indian Mathematics & Science Education (Project PRIME)			✓	✓	✓	✓	✓
	NAU: Community Science Programs	✓	✓	✓		✓		✓
	ASU-West: Family-School Cooperative	✓	✓		✓	✓		
	ASU: Math Enhancement for the Gila River Indian Community	✓	✓		✓	✓		
1991-92 Phase II	SMCC: Hands-On Mathematics	4-8				✓		
	MCC: Grow Your Own	K-8 Teacher Aides & Comm. college students			✓	✓	✓	✓
	U/A: Current Topics for Biology		✓	✓			✓	✓
	U/A: Using Insects in Science/Math	✓					✓	✓
	U/A: Family Science		✓				✓	✓
	U/A: Spanish Language NASA Materials	✓	✓				✓	
	NAU: ASEED (Extension)	✓	✓				✓	✓

Table H-3--*continued*

Year	IHE: Project	Teacher Grade Level			Program Emphasis			
		Elem (K-5)	MS (6-8)	HS (9-12)	Mathematics		Science	
					Cont	Pedag	Cont	Pedag
1992-93	NAU: Marvelous World of Molecules	✓					✓	
	NAU: Development of Secondary Earth Science Curriculum			✓			✓	
	ASU: Math Enhancement for the Gila River Indian Community (Extension)	✓	✓		✓	✓		
	ASU-West: Math/Science in Rural Schools	✓	✓			✓		✓
	NAU: Modern Physics for Middle School Teachers		✓				✓	✓
	U/A: Middle School Science		✓					✓
	U/A-Sierra Vista: Primary Science/Math Partnerships	✓					✓	✓
	SMCC: Hands-On Mathematics	4-9				✓		
	ASU-West: Pre-Algebra Academy			9		✓		

APPENDIX I

Federal Regulations Governing IHE Eisenhower Programs

(Selected Excerpts)

This appendix contains information abstracted from:

- Title II, Part A of the Education for Economic Security Act, Elementary and Secondary Education Act (ESEA) of 1965;
- Title II, Part A of the Dwight D. Eisenhower Mathematics and Science Education Act, Augustus F. Hawkins-Robert T. Stafford Elementary and Secondary School Improvement Amendments of 1988 (P.L. 100-297); (Federal Register, Vol. 54, No. 153, Thursday, August 10, 1989); and,
- Title II, Part A of the Excellence in Mathematics, Science and Engineering Education Act of 1990 (P.L. 101-589); (Federal Register, Vol. 57, No. 99, Thursday, May 21, 1992).

TITLE II -- CRITICAL SKILLS IMPROVEMENT

PART A -- DWIGHT D. EISENHOWER MATHEMATICS AND SCIENCE EDUCATION ACT

SEC. 2001. SHORT TITLE.

This part may be cited as the 'Dwight D. Eisenhower Mathematics and Science Education Act'.

SEC. 2002. STATEMENT OF PURPOSE

The purpose of this part is to strengthen the economic competitiveness and national security of the United States by improving the skills of teachers and the quality of instruction in mathematics and science in the nation's public and private elementary and secondary school through assistance to State educational agencies, local educational agencies, and institutions of higher education.

(2007)(b) GRANTS TO INSTITUTIONS OF HIGHER EDUCATION. -- **(1) (A)** Not less than 95 percent of the amount available for this section shall be used by the State agency for higher education for grants to institutions of higher education in accordance with the provisions of this subsection.

(B) The State agency for higher education shall make funds available on a competitive basis to institutions of higher education in the State which apply for payments under this section and which demonstrate the involvement of local educational agencies. The State agency for higher education shall make every effort to ensure equitable participation of private and public institutions of higher education.

(2) The amount available under this subsection shall be used for--

(A) establishing traineeship programs for new teachers who will specialize in teaching mathematics and science at the secondary school level;

(B) retraining of secondary school teachers who specialize in disciplines other than the teaching of mathematics or science, including the provision of stipends for participation in institutes authorized under title I of the Education for Economic Security Act or any other program of the National Science Foundation; and

(C) inservice training for elementary, secondary, and vocational school teachers and training for other appropriate school personnel to improve their teaching skills in the fields of mathematics and science, including stipends for participation in institutes authorized under title I of the Education for Economic Security Act or any other program of the National Science Foundation.

Each institution of higher education receiving a grant under this subsection shall assure that programs of training, retraining, and inservice training will take into account the need for greater access to and participation in mathematics and science and careers by students from historically underrepresented and underserved groups, including females, minorities, individuals with limited-English proficiency, the handicapped, migrants, and the gifted and talented, and will ensure cooperative agreements or cooperative arrangements with local educational agencies.

(3) No institution of higher education may receive assistance under paragraphs (2)(B) and (2)(C) of this subsection unless the institution enters into an agreement with a local educational agency, or consortium of such agencies, to provide inservice training and retraining of the elementary and secondary school teachers in the public and private schools of the school district of each such agency.

(2007)(c) COOPERATIVE PROGRAMS. -- The State agency for higher education may use funds described in subsection (b)(1)(A) for cooperative programs among institutions of higher education, local educational agencies, State educational agencies, private industry, and nonprofit organizations, including museums, libraries, educational television stations, and professional mathematics, science, and engineering societies and associations for the *development* and *dissemination* of projects designed to improve student understanding and performance in science and mathematics.

(2007)(d) ASSESSMENT AND ADMINISTRATIVE COSTS. -- Not to exceed 5 percent of the amount available under this section may be used by the State agency for higher education for--
(1) the State assessment required by section 2008(c); and
(2) the costs incurred by such agency for administration and evaluation of programs assisted under this part.

DEPARTMENT OF EDUCATION

34 CFR Part 208 (Federal Register, Vol. 54, No. 153, Thursday, August 10, 1989)

Mathematics-Science Education Program; State Grants

SUMMARY: The Secretary issues these regulations for the program of State grants for strengthening the economic competitiveness and national security of the United States by improving the skills of teachers and the quality of instruction in mathematics and science in the Nation's public and private schools. These regulations implement the changes in the Mathematics and Science Education Program as a result of its reauthorization as the Dwight D. Eisenhower Mathematics and Science Education Act of 1988.

Subpart B -- Application Procedures.

208.11 State application.
(a) Of the amount allotted to each State under section 2004 of the Act, the Secretary awards, on the basis of approved State applications, 75 percent to the State's SEA for elementary and secondary education programs and 25 percent to the State's SAHE for higher education

programs. ...The SAHE shall apportion these funds in accordance with 208.31.

(b) A State that desires to receive funds under this part shall have on file with the Secretary an application that covers a period of three fiscal years. Each State application *must*--

(1) Designate the SEA as the agency responsible for the administration and supervision of the elementary and secondary education programs described in subpart C of this part and the SAHE as the agency responsible for the administration and supervision of the higher education programs described in subpart D of this part;

(2) Provide assurances that--

(i) Payments will be distributed by the State in accordance with the provisions of 208.21 and 208.31;

(ii) Provision will be made for the equitable participation of nonprofit private school children and teachers, in accordance with 208.51, in elementary and secondary education programs described in subpart F of this part;

(iii) Provision will be made for fiscal control and accounting procedures to ensure proper accounting and expenditure of funds made available under this part;

(iv) Funds made available under this part will be used to supplement and not supplant non-Federal funds in accordance with 208.41;

(v) During the three-year period of the plan, the State will evaluate its standards for teacher preparation, licensing, certification, and endorsement for elementary and secondary mathematics and science;

(vi) The State will take into account the needs for greater access to, and participation in, mathematics and science by students and teachers from historically underrepresented and underserved groups, including females, minorities, individuals with limited English proficiency, the economically disadvantaged, and the handicapped;

(vii) The needs of teachers and students in areas of high concentrations of low-income students and sparsely populated areas will be considered in the distribution of funds reserved for State use; and

(viii) The programs conducted with State funds will be assessed annually (including collecting statistics on the number of students and teachers involved in these programs) and the data from these assessments, as well as a summary of the local assessments required under 208.22(b)(1), will be submitted to the Secretary;

(3) Provide descriptions of--

(i) How, if appropriate, funds paid under this part will be coordinated with State and local funds and other Federal resources, particularly resources available from the National Science Foundation or the Department of Energy, or both;

(ii) Procedures for--

(A) Submitting applications for the programs described in subparts C and D of this part; and

(B) Approval of applications by the appropriate State agency, including procedures to ensure in accordance with 34 CFR 76.401 that the State agency will not disapprove an application without notice and opportunity for a hearing. Disapproval of an application *does not* include a determination by a SAHE as to the relative merit of a competing application submitted under 208.32;

(iii) How programs under this part will meet the teacher training and curriculum needs projected under paragraph (b)(4) of this section;

(iv) Specific activities that will be undertaken that involve IHEs;

(v) Specific activities that will be supported with funds reserved for State use, and how those activities relate to the State's needs in mathematics and science; and

(vi) Specific activities the State will support to improve access of historically underrepresented groups in mathematics and science education; and

(4) Contain the following information:

(i) A projection of the supply and demand for teachers within the State in all the mathematics and science subject areas at the elementary and secondary levels, including a consideration of the impact of changing State graduation requirements and other State reforms on the supply of those teachers;

(ii) An assessment of the current elementary and secondary curriculum needs within the State in mathematics and science.

(c) The Secretary approves any State application that meets the requirements of this section.

(Authority: 20 U.S.C. 2988)

Subpart D -- Higher Education Programs and Activities

208.31 Apportionment of funds.

(a) *Funds for IHEs.* (1) A SAHE shall distribute not less than ninety-five (95) percent of the funds it receives under 208.11(a) to IHEs in accordance with the application procedures governing IHEs in 208.32.

(2) The SAHE shall make every effort to ensure equitable participation of public and private IHEs.

(3) The SAHE may use funds described in this section for cooperative programs among IHEs, LEAs, SAEs, private industry, and nonprofit organizations, for the development and dissemination of projects designed to improve student understanding and performance in science and mathematics.

(b) *Funds retained by SAHEs.* A SAHE may reserve not more than five percent of the funds it receives under 208.11 for the costs incurred by the SAHE for the State assessment of curriculum needs required by 208.11(b)(4)(ii) and for administration and evaluation of programs assisted under this part.

(Authority: 20 U.S.C. 2987)

208.32 IHE application.

An IHE wishing to receive a grant for programs funded under the Act may apply to the SAHE on a competitive basis either as an individual subgrantee or on behalf of a proposed cooperative program (see 208.31(a)(3)).The application must contain information that the SAHE may require, and must demonstrate the IHE's involvement with one or more LEAs, as required by 208.33(d).

(Authority: 20 U.S.C. 2987)

208.33 Use of funds by IHEs.

(a) Subject to the requirement in paragraph (c) of this section, an IHE shall use funds awarded under 208.31(a) for one or more of the following activities:

(1) Establishing traineeship programs for new teachers who will specialize in teaching mathematics and science at the secondary school level.

(2) Retraining. (i) Teachers who specialize in disciplines other than the teaching of mathematics or science, to specialize in the teaching of mathematics and science; or

(ii) Mathematics and science secondary school teachers to expand their areas of specialization within those disciplines (e.g., retraining biology teachers in physics or geometry teachers in calculus) or to expand their specializations across disciplines (e.g., retraining biology teachers in algebra).

(3) Inservice training for elementary, secondary, and vocational school teachers and training for other appropriate school personnel to improve their teaching skills in the fields of mathematics and science.

(b) Support for inservice training and retraining includes the provision of stipends for participation in institutes authorized under Title I of the ESEA or any other program of the National Science Foundation.

(c) Each IHE receiving funds under this part shall ensure that programs of training, retraining, and inservice training will take into account the need for greater access to and participation in mathematics and science, and careers for--

(1) Students from historically underrepresented and underserved groups, including females, minorities, individuals with limited English proficiency, the handicapped, and migrants; and

(2) Gifted and talented students.

(d)(1) To receive funds for programs under paragraphs (1) (2) and (3) of this section, an IHE shall enter into an agreement with an LEA, or a consortium of LEAs, to provide inservice training and retraining for elementary and secondary school teachers in public and private schools in the LEA or LEAs.

(2) In the agreement, the IHE shall provide evidence that proposed projects and activities are the result of cooperative planning with LEAs affected, and that those projects and activities reflect the training, retraining, and inservice training needs of teachers as determined by the LEA or LEAs and the IHE.

(Authority: 20 U.S.C. 2987)

DEPARTMENT OF EDUCATION

34 CFR Part 208 (Federal Register, Vol. 57, No. 99, Thursday, May 21, 1992)

Eisenhower Mathematics and Science Education -- State Grant Program

SUMMARY: The Secretary amends the regulations governing the Eisenhower Mathematics and Science Education State Grant Program. These regulations implement the changes resulting from amendments enacted in title II, part A, of the Excellence in Mathematics, Science and Engineering Education Act of 1990, and make several technical changes, including a change in the formula for allocating funds to local educational agencies.

SUPPLEMENTARY INFORMATION:
...The Secretary is amending the regulations in 34 CFR part 208 to implement those changes [resulting from the Excellence in Mathematics, Science and Engineering Education Act] and several others that would promote more effective use of program funds.

Effective Teacher Training Programs

In 208.11, 208.22, and 208.32, the Secretary requires State, local educational agencies, and institutions of higher education (IHE) applications to describe how those agencies ensure that training programs will be of high quality and of sufficient duration and intensity to promote a lasting effect on the improvement of teacher performance and student learning. While the Secretary is not requiring that activities be of any particular level of intensity or duration, these provisions will help promote the use of Eisenhower Act funds in ways that are more effective such as those discussed by SRI International in its

February, 1991 study of the Eisenhower Program. In that report, SRI noted that professional development activities are most effective if they (1) are related to long-term improvement goals, (2) are of sufficient intensity to allow for integration into understanding and implementation, (3) are related to classroom assignments, (4) include professional teams (rather than individuals) that can work with each other over time, (5) have follow-up activities or reinforcement activities or both, and (6) have the administrative and policy support of the school or LEA. The SRI findings are sound guidelines that States, LEAs, and IHEs should use in developing their professional training strategies.

Emphasis on Training in Elementary and Middle Schools

Section 202 of the Excellence in Mathematics, Science and Engineering Education Act of 1990 requires that all Eisenhower Act funds received by each LEA in excess of the amount received from the fiscal year 1990 appropriation be used to provide training for mathematics and science teachers in elementary and middle schools. Prior to the passage of this statute, Congress' Joint Committee of Conference issues a Joint Explanatory Statement (*Congressional Record*, October 24, 1990, H 11718) in which it emphasized that the requirement in section 202 that all additional Eisenhower funds be expended for teacher training at the elementary and middle school levels was intended to "place a priority" on training at these levels....

Formation of Consortia

Consistent with section 201 of the 1990 statute, 208.22(d) is revised to require that, unless waived by the SEA, any LEA that receives an Eisenhower Act allocation of less than $6,000 must form a consortium with at least one other LEA *or* with an IHE that has received either a grant from the SEA to operate a demonstration and exemplary program under 208.24 *or* a competitive grant from the State agency for higher education (SAHE) under 208.31(a). This provision further requires that each consortium be comprised of LEAs or IHEs whose collective Eisenhower Act funds total at least $6,000....

Funds Reserved for Administration, Technical Assistance, and Assessment

Sections 208.21(c) and 208.31(b) reflect that statutory changes that allow both the SEA and the SAHE to reserve up to the greater of $20,000 or five percent of the funds allotted to them for administration, technical assistance, and assessment. Technical changes are also made in 208.21(a) and 208.31(a)(1) to reflect the new levels of funds that are available to be distributed to LEAs and IHEs.

APPENDIX J

Preliminary Recommendations[1]

On May 20, 1993 a one-day meeting was held with 24 key mathematics and science specialists/educators in order to get their reactions to 52 separate recommendations pertaining to Arizona's IHE Eisenhower program. Of these 24 participants, half were selected because of direct participation in an IHE Eisenhower project; half because of high-visibility involvement in state mathematics and science education and training efforts, including the *State Systemic Initiative* (SSI). Thirteen participants were women; 11 were men. One-quarter of the group represented ethnic minorities. All four state public universities were represented (Arizona State University, Arizona State University-West, Northern Arizona University and the University of Arizona), as were two community colleges, the community college-based Comprehensive Regional Center for Minorities, and one private institution of higher education (e.g., Grand Canyon College). The special interests of K-12 teachers and students were reflected specifically by members of the Arizona Department of Education and the director of Project SMART, an NSF teacher-training project coordinated out of the Mammoth-San Manuel Unified School District.

Working in small groups, this panel of experts was charged with reviewing each proposed recommendation and determining an appropriate course of action including adopting a recommendation as written, rewording or otherwise modifying a recommendation, deleting a recommendation, recommendation. Once adopted or adapted, panel members rated recommendations as either "essential," "highly desirabe," or "optional." Small group recommendations were presented to the entire group for discussion and reaction. All groups decisions were made with the understanding that Institute analysts would be ultimately responsible for final recommendations made to the Arizona Board of Regents.

In the ensuing text, panel decisions are noted as follows:

- Recommendations adopted "as is" are so noted, with a priority rating.
- "Adapted" recommendations are indicated in the text. Deletions are noted with strikeouts (~~strikeouts~~); additions are noted with italics (*italics*). Adapted recommendations are also assigned priority ratings.
- Deleted recommendations are checked "No" under the column "Adopt?"
- Added recommendations, and explanatory comments, are noted following each chart. For the most part, wording is included verbatim from panel notes.

[1] This appendix contains suggestions and recommendations made by Arizona mathematics and science education and training experts. Morrison Institute wishes to acknowledge these people and credit them for their fine contributions to this study. The Institute takes sole responsibility, however, for recommendations made in the body of this report.

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PROPOSED RECOMMENDATION	ACTION RECOMMENDED				
	ADOPT?		PRIORITY STATUS		
1. Establish a permanent position for the administration of Arizona's IHE Eisenhower program.	NO	YES	1 Essential	2 Highly Desirable	3 Optional
1.1 Monitor whether the position as advertised (i.e., quarter-time) is sufficient for maintaining administrative continuity over time.	✓				

Comments/Other recommendations (if any):

1. Establish a permanent position for the administration of Arizona's K-12 and IHE Eisenhower program (75% K-12 and 25% IHE). 1st priority: Joint with ADE, 2nd: ABOR and community colleges, 3rd: stand alone [i.e. the quarter-time position as advertised, in which case 1.1 is rated essential].

2. Establish an Advisory Board with representation from all levels of education and other sources such as business, social agencies, etc.

3. Coordinate the submission of LEA applications and IHE RFPs.

PROPOSED RECOMMENDATION **2. Revise and institutionalize an annual funding cycle.**	**ACTION RECOMMENDED**				
	ADOPT?		**PRIORITY STATUS**		
	NO	**YES**	**1 Essential**	**2 Highly Desirable**	**3 Optional**
2.1 Create a categorical funding model.	✓				
2.2 Establish one category for cooperative programs and another category to support teacher preparation and enhancement programs.	✓				
2.3 Establish and maintain consistent and uniform project cycles.		✓		✓	
2.4 Consider three-year funding for pilot cooperative programs.	✓		**See comments**		
2.5 Consider a 15-month project cycle for teacher preparation and enhancement programs (e.g., January - March; June - August; September -November).	✓				
2.6 Maintain project budgets at ~~around~~ *a maximum of* $50,000 per year ($150,000 for three years; *$75,000 for 18 months*).		✓		✓	
2.7 Require that cooperative programs be school-based and provide evidence of ~~matching LEA funds~~ *commitment by participating organizations*.		✓		✓	

Comments/Other recommendations (if any):

Recommendations in lieu of 2.4 and 2.5

- RFP out Sept 1 - Sept 15
- X deadline for proposals
- Notification re: proposals by December 15
- Flexible start time as stated in the individual proposal with funding available as early as January
- Length of time: 18 months with request for renewal or a no-cost extension as an option

PROPOSED RECOMMENDATION **3. Improve access to/broaden the distribution of RFPs.**	ACTION RECOMMENDED				
	ADOPT?		PRIORITY STATUS		
	NO	YES	1 Essential	2 Highly Desirable	3 Optional
3.1 ~~Advertise~~ *Announce* grant availability at the same time each year.		✓	✓		
3.2 ~~Advertise~~ *Announce* the availability of grants to all state LEAs, museums, zoos, and other agencies representing potential partners in an IHE program. Encourage these agencies to ~~submit a plan~~ *collaborate with* an IHE of their choice *to develop a plan*.		✓	✓		
3.3 *Institutions should* develop a list of IHE liaisons/contacts to distribute to non-IHE agencies along with grant announcements.		✓	✓		

Comments/Other recommendations (if any):

3.1 LEAs should receive information about grant requirement, contacts, time tables, need for matching funds. This information should be available to LEAs before RFPs are available.

3.2 Note: Museums, zoos and other agencies may be a partner, but cannot substitute for an LEA.

3.3 Institutions develop list of contacts. These institutions should include all IHEs (public and private). (IHEs include community colleges.) Note: The role of private universities needs to be clarified.

3.4 RFPs should be sent to institutional contacts, grants offices and chief academic officers.
Priority: Essential

PROPOSED RECOMMENDATION **4. Revise the RFP, modeling it after other states' successful RFPs.**	ACTION RECOMMENDED				
	ADOPT?		PRIORITY STATUS		
	NO	YES	1 Essential	2 Highly Desirable	3 Optional
4.1 Clarify the distinction between cooperative programs and teacher preparation and enhancement programs.		✓	✓		
4.2 Strengthen requirements for evidence of LEA involvement in cooperative planning, implementation and evaluation.		✓	✓		
4.2.1 Solicit school-based projects *to build capacity*.		✓	See comments under 4.2		
4.2.2 Require *or strongly recommend* LEA matching funds *or in-kind support, in proportion to the LEA's ability to contribute,* as evidence of an LEA's commitment to implementation.		✓			
4.3 Broaden the language soliciting proposals to emphasize all underrepresented groups.		✓	✓ comments		
4.4 Preserve attention on ethnic minority participation through awarding points on applications that specifically identify strategies for recruiting minority teachers and/or that identify numbers of minority teacher participants.	✓				
4.5 Continue to encourage business and industry, or non-education, partnerships *to the extent that partnerships 1) enhance the project and 2) are available to LEAs and IHEs.*		✓		✓	
4.5.1 Consider awarding bonus points for applications that include such partnerships.	✓				
4.6 Maintain emphasis on elementary and middle school groups.		✓		✓	
4.7 Require project descriptions to address six elements of program quality as defined by the U.S. Department of Education.			See comments under 4.9		
4.8 Incorporate the six elements of quality as project narrative requirements and in a rating scale to critique proposals and award grants.					

PROPOSED RECOMMENDATION **4. Revise the RFP, modeling it after other states' successful RFPs -- *continued***	ACTION RECOMMENDED				
	ADOPT?		PRIORITY STATUS		
	NO	YES	1 Essential	2 Highly Desirable	3 Optional
4.9 Align the two sections of the RFP that deal with the "Format for Proposals" and "Evaluation/Selection Criteria."		✓	✓		
4.9.1 Use the general categories for evaluating/selecting proposals as stated in the most recent RFP: 1) Demonstrated Need/ Improvement of the Quality of Teaching & Instruction; 2) Plan of Operation; 3) Evaluation Plan; 4) Underrepresented Student Access; 5) Budget & Cost Effectiveness; and 6) Application Commitment & Capacity Building *for Systemic Change*.		✓	✓		
4.10 Require applicants to format their proposal narratives using these criteria in *exactly* the same order as they appear on the evaluation/selection criteria.		✓	✓		
4.11 Make sure that newly-aligned sections reinforce program practices as described and defined in the "Solicitation of Proposals" section.		✓	✓		
4.12 Develop specific requirements for program evaluation at the local level and set evaluation standards.		✓	✓		
4.12.1 Require both process and outcomes evaluations.			See comments		
4.12.1.1 Require evidence of both student and teacher outcomes for cooperative programs.					
4.12.1.2 Require evidence of teacher outcomes only for teacher preparation and enhancement programs.					
4.12.2 Providing sample models of evaluations in the RFP.					
4.12.3 Assigning more points to evaluation plans in the evaluation/selection criteria in order to strengthen this component of Arizona proposals.					
4.13 Create a checklist for the RFP and review process.		✓	✓		

Comments/Other recommendations (if any):

4.2
- Align RFP schedules for IHEs and LEAs
- Proposals to align with school goals and state *Essential Skills*
- Use the term "capacity building" in 4.2.1
- Clarify "school-based" to solicit such proposals
- [Place] high premium on collaborative projects; must clearly demonstrate collaboration efforts
- Require (or strongly recommend) matching funds of in-kind support in proportion to the LEA's ability to contribute

4.3 Use a list of underrepresented groups including rural populations, Native American Indians, females, migrant populations, low SES, ethnic minorities, the handicapped, LEP students, and the academically talented, or any combination. Thereafter, use the term "underrepresented."

4.9.1 Explicitly incorporate 4.7 and 4.8 into 4.9.1, Category #1. (Change 4.7 to 4.9.2; 4.8 to 4.9.3).

4.12 Proposals should include a research component that provides the following: 1) data on the effectiveness of the project in the school system to be used by participants to enhance systemic change; 2) a study of systemic change at the site of the project; and, 3) a contribution to the knowledge base on exemplary education practice.

PROPOSED RECOMMENDATION **5. Revise the grant application review process.**	ACTION RECOMMENDED				
	ADOPT?		PRIORITY STATUS		
	NO	YES	1 Essential	2 Highly Desirable	3 Optional
5.1 Adopt an alternative model for staffing a review panel. At a minimum, include representation of the Arizona Department of Education in order to promote collaborative planning between these two agencies.		✓	✓		
5.2 Preserve the composition of the panel over time.		✓	✓		
5.3 Develop written policies regarding the role and authority of the ABOR Eisenhower program coordinator in determining grantees.		✓	✓		
5.4 Make known these policies to proposal submitters.		✓	✓		
5.5 Provide training for proposal reviewers prior to their involvement in the selection process.		✓	✓		

Comments/Other recommendations (if any):

5.1 A panel of 8-10 individuals: community agencies, business, consultant, government agencies, IHE, K-12, SEA, minority and rural representation, equity, assessment. In-state people can be used for both monetary reasons and knowledge of Arizona. Outside representation could be Far West Regional Labs.

5.2 Preserve the categories but rotate the people.

5.3 Program coordinator should not serve on the panel, but act as a facilitator and technical advisor to both the panel and submitters. Conduct negotiations with submitters.

5.5 [Hold] a conference to explain the policies. The conference could be used to form a pool of reviewers. This could be held every three years to assist in the development of the state plan. Solicit technical and financial resources from K-12 and IHE instructors to develop, maintain, and implement the review process.

PROPOSED RECOMMENDATION **6. Institute a technical assistance program for IHE Eisenhower grantees.**	ACTION RECOMMENDED				
	ADOPT?		PRIORITY STATUS		
	NO	YES	1 Essential	2 Highly Desirable	3 Optional
6.1 Provide grant-writing assistance.		✓		✓	
6.1.1 Offer a proposal writing workshop(s).		✓		✓	
6.1.2 Establish a grant-writing "hot line" for answering the most commonly asked questions regarding IHE programs and proposals.	✓				
6.2 ~~Broker~~ *Provide* technical ~~assistance in designing local evaluations and/or other areas~~ *advice (by consultants on retainer) in areas such as evaluation design, program design, and budget.*		✓	✓		
6.2.1 ~~Develop~~ *Provide* a list of *available project* evaluation~~/other experts as~~ consultants ~~to projects/proposal writers.~~		✓		✓	
6.3 Provide written feedback *from reviewers* on ~~unsuccessful~~ *all* proposals.		✓	✓		

Comments/Other recommendations (if any):

6.1.1 Include in-person, video, live satellite

6.1.2 Replace with: *Pre-proposal review by ABOR Eisenhower administrator optional [for proposal writers].* *Priority: Highly Desirable*
(This may require more time.)

6.1.3 The RFP should include answers to the most commonly asked questions. *Priority: Essential*

PROPOSED RECOMMENDATION **7. Design a new state-level evaluation.**	ACTION RECOMMENDED				
	ADOPT?		PRIORITY STATUS		
	NO	YES	1 Essential	2 Highly Desirable	3 Optional
7.1 Discontinue the use of current forms for collecting participant information.		✓	✓		
7.2 Focus more on "the overall policy" as a standard for evaluation.	✓				
7.3 Structure local evaluation requirements to allow for some aggregation of quantitative and qualitative data at the state level. Consider:	✓				
7.3.1 Involving site visits/case studies.	✓				
7.3.2 Employing a more formalized evaluation design such as a meta-analysis or an experiment with control groups to determine what works.	✓				
7.4 Require and summarize "real data" from local program evaluations (as opposed to questionnaire results).	✓				
7.5 Report progress on Arizona's *Essential Skills* and Arizona Student Assessment Program (ASAP) results as measures of program success at the state level.	✓				
7.6 Periodically produce an evaluation report summarizing programs and evaluation results.		✓	✓		
7.7 Disseminate the state's evaluation report.		✓	✓		

Comments/Other recommendations (if any):

Develop and implement a coherent strategy for a state-level evaluation program consistent with the national and state-level goals for math and science. Variables to be addressed include: 1) Impact on teacher development and students learning; 2) Impact on student learning or academic learning behavior; 3) Demographics of teachers and students; 4) Impact on systemic change. *Priority: Essential*

State-level evaluation:

Use state-level program evaluation results to deed into identifying objectives for subsequent funding priorities. (A good research project.) That is, evaluation should translate into program changes.

State-level evaluation strategy should include the use of state-level data, such as ASAP and DAP, as well as the aggregation of individual projects.

PROPOSED RECOMMENDATION	ACTION RECOMMENDED				
	ADOPT?		PRIORITY STATUS		
8. Strengthen the dissemination of "what works" in mathematics and science education and training.	NO	YES	1 Essential	2 Highly Desirable	3 Optional
8.1 Improve dissemination of Eisenhower program information at state-level meetings.		✓		✓	
8.2 ~~Sponsor/~~co-sponsor a state-level meeting on mathematics and science education and training programs.		✓			✓
8.3 Strengthen RFP requirements for project dissemination plans and reinforce the requirement. Consider requiring that projects:		✓		✓	
8.3.1 Present at a state-level meeting *and/or;*		✓			✓
8.3.2 Publish project results in a journal *and/or;*		✓			✓
8.3.3 Provide training to another LEA *and/or (see 8.3.4).*		✓			✓
8.4 Create a speakers bureau.	✓				
8.5 ~~Develop/improve~~ *Utilize* electronic communication (e.g., E-mail; databases) with IHEs and LEAs.		✓			✓
8.6 Develop publications/newsletters/catalogs.		✓	✓		

Comments/Other recommendations (if any):

8.3.4 Publish in newsletter (see 8.6)

8.6 Newsletter is most appropriate; quarterly

PROPOSED RECOMMENDATION	ACTION RECOMMENDED				
	ADOPT?		PRIORITY STATUS		
9. Develop a ~~contingency~~ plan for coordinating IHE Eisenhower programs with ~~proposed~~ reform efforts encompassed by the ~~SSI~~ *Arizona Systemic Initiative.*	NO	YES	1 Essential	2 Highly Desirable	3 Optional
9.1 Request that the ABOR Eisenhower program coordinator be appointed to the SSI Steering Committee.	✓				
9.2 Appoint a member of the SSI Steering Committee to the grant application review panel.	✓				
9.3 Add language to the IHE Eisenhower RFP that would reinforce cooperative and teacher enhancement and training programs based on local systemic plans.		✓	✓		
9.4 Add language to the IHE Eisenhower RFP on local evaluation reinforcing the use of ASAP results (for student-centered programs).		✓	✓		
9.5 Coordinate the development of a state-level evaluation of IHE Eisenhower programs with ~~SSI~~ *ASI* state-level evaluation efforts.		✓	✓		
9.6 Award bonus points to proposals originating from an ~~SSI~~ *ASI* state-certified teacher training center.		✓	✓		
9.7 Award bonus points to proposals strengthening preservice education that are designed to promote and reinforce Arizona's mathematics and science Essential Skills.		✓	✓		

Comments/Other recommendations (if any):

- [Establish a] clearinghouse to maintain communication; Use technology such as E-mail, satellite T.V., telephones, conferences, Channel 8, telecommunications conferences; Use Science and Math Association meetings.
- *If* Eisenhower program administration is joint between ADE and ABOR, then this would be a likely place to access [a clearinghouse]; would provide a central spot for the coordination of efforts.
- Link with business organizations, business development program.
- ABOR, ADE, Governor's Office, all educational business associations should convene an educational summit to develop a vision for ASI and next steps.

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